MHR

Enrange MHR Radio Controller

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Your New Radio Receiver

Thank you for your purchase of Magnetek's Enrange™ MHR Radio Controller. Magnetek has set a whole new standard in wireless control performance, dependability, and value with this unique new line of Mobile Hydraulic Controllers.

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PRODUCT MANUAL SAFETY INFORMATION

Magnetek, Inc. (Magnetek) offers a broad range of radio remote control products, control products and adjustable frequency drives, and industrial braking systems for overhead material handling applications. This manual has been prepared by Magnetek to provide information and recommendations for the installation, use, operation and service of Magnetek's material handling products and systems (Magnetek Products). Anyone who uses, operates, maintains, services, installs or owns Magnetek Products should know, understand and follow the instructions and safety recommendations in this manual for Magnetek Products.

The recommendations in this manual do not take precedence over any of the following requirements relating to cranes, hoists and lifting devices:

- Instructions, manuals, and safety warnings of the manufacturers of the equipment where the radio system is used,
- Plant safety rules and procedures of the employers and the owners of facilities where the Magnetek Products are being used,
- Regulations issued by the Occupational Health and Safety Administration (OSHA),
- Applicable local, state or federal codes, ordinances, standards and requirements, or
- Safety standards and practices for the overhead material handling industry.

This manual does not include or address the specific instructions and safety warnings of these manufacturers or any of the other requirements listed above. It is the responsibility of the owners, users and operators of the Magnetek Products to know, understand and follow all of these requirements. It is the responsibility of the owner of the Magnetek Products to make its employees aware of all of the above listed requirements and to make certain that all operators are properly trained. **No one should use Magnetek Products prior to becoming familiar with and being trained in these requirements.**

WARRANTY INFORMATION

FOR INFORMATION ON MAGNETEK'S PRODUCT WARRANTIES BY PRODUCT TYPE, PLEASE VISIT WWW.MAGNETEK.COM.

WARNINGS and CAUTIONS

Throughout this document WARNING and CAUTION statements have been deliberately placed to highlight items critical to the protection of personnel and equipment.

WARNING – A warning highlights an essential operating or maintenance procedure, practice, etc. which if not strictly observed, could result in injury or death of personnel, or long term physical hazards. Warnings are highlighted as shown below:

CAUTION – A caution highlights an essential operating or maintenance procedure, practice, etc. which if not strictly observed, could result in damage to, or destruction of equipment, or loss of functional effectiveness. Cautions are highlighted as shown below:

WARNINGS and CAUTIONS SHOULD NEVER BE DISREGARDED.

The safety rules in this section are not intended to replace any rules or regulations of any applicable local, state, or federal governing organizations. Always follow your local lockout and tagout procedure when maintaining any radio equipment. The following information is intended to be used in conjunction with other rules or regulations already in existence. It is important to read all of the safety information contained in this section before installing or operating the Radio Control System.

1.0 CRITICAL INSTALLATION CONSIDERATIONS

WARNING

ONLY QUALIFIED INSTALLERS SHOULD INSTALL THIS RADIO CONTROL EQUIPMENT. THIS MANUAL SHOULD BE CONSULTED TO MINIMIZE POTENTIAL HAZARDS WITH THE EQUIPMENT INTERFACED. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

WARNING

PRIOR TO INSTALLATION AND OPERATION OF THIS EQUIPMENT, READ AND DEVELOP AN UNDERSTANDING OF THE CONTENTS OF THIS MANUAL AND THE OPERATION MANUAL OF THE EQUIPMENT OR DEVICE TO WHICH THIS EQUIPMENT WILL BE INTERFACED. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

ALL EQUIPMENT MUST HAVE A MAINLINE CONTACTOR INSTALLED AND ALL TRACKED CRANES, HOISTS, LIFTING DEVICES AND SIMILAR EQUIPMENT MUST HAVE A BRAKE INSTALLED. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

AN AUDIBLE AND/OR VISUAL WARNING MEANS MUST BE PROVIDED ON ALL REMOTE CONTROLLED EQUIPMENT AS REQUIRED BY CODE, REGULATION, OR INDUSTRY STANDARD. THESE AUDIBLE AND/OR VISUAL WARNING DEVICES MUST MEET ALL GOVERNMENTAL REQUIREMENTS. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

FOLLOW YOUR LOCAL LOCKOUT TAGOUT PROCEDURE BEFORE MAINTAINING ANY REMOTE CONTROLLED EQUIPMENT. ALWAYS REMOVE ALL ELECTRICAL POWER FROM THE CRANE, HOIST, LIFTING DEVICE OR SIMILAR EQUIPMENT BEFORE ATTEMPTING ANY INSTALLATION PROCEDURES. DE-ENERGIZE AND TAGOUT ALL SOURCES OF ELECTRICAL POWER BEFORE TOUCH-TESTING ANY EQUIPMENT. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

THE DIRECT OUTPUTS OF THIS PRODUCT ARE NOT DESIGNED TO INTERFACE DIRECTLY TO TWO STATE SAFETY CRITICAL MAINTAINED FUNCTIONS, I.E., MAGNETS, VACUUM LIFTS, PUMPS, EMERGENCY EQUIPMENT, ETC. A MECHANICALLY LOCKING INTERMEDIATE RELAY SYSTEM WITH SEPARATE POWER CONSIDERATIONS MUST BE PROVIDED. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH OR DAMAGE TO EQUIPMENT.

1.1 GENERAL

Radio controlled material handling equipment operates in several directions. Cranes, hoists, lifting devices and other material handling equipment can be large, and operate at high speeds. Quite frequently, the equipment is operated in areas where people are working in close proximity to the material handling equipment. **The operator must exercise extreme caution at all times**. Workers must constantly be alert to avoid accidents. The following recommendations have been included to indicate how careful and thoughtful actions may prevent injuries, damage to equipment, or even save a life.

1.2 PERSONS AUTHORIZED TO OPERATE RADIO CONTROLLED EQUIPMENT

Only properly trained persons designated by management should be permitted to operate radio controlled equipment.

Radio controlled cranes, hoists, lifting devices and other material handling equipment should not be operated by any person who cannot read or understand signs, notices and operating instructions that pertain to the equipment.

Radio controlled equipment should not be operated by any person with insufficient eyesight or hearing or by any person who may be suffering from a disorder or illness, is taking any medication that may cause loss of equipment control, or is under the influence of alcohol or drugs.

1.3 SAFETY INFORMATION & RECOMMENDED TRAINING FOR OPERATORS

Anyone being trained to operate radio controlled equipment should possess as a minimum the following knowledge and skills before using the radio controlled equipment.

The operator should:

- Have knowledge of hazards pertaining to equipment operation
- Have knowledge of safety rules for radio controlled equipment
- Have the ability to judge distance of moving objects
- Know how to properly test prior to operation
- Be trained in the safe operation of the radio receiver as it pertains to the crane, hoist, lifting device or other material handling equipment being operated
- Have knowledge of the use of equipment warning lights and alarms
- Have knowledge of the proper storage space for a radio control receiver when not in use
- Be trained in transferring a radio control receiver to another person
- Be trained how and when to report unsafe or unusual operating conditions
- Test the receiver emergency stop and all warning devices prior to operation; testing should be done on each shift, without a load
- Be thoroughly trained and knowledgeable in proper and safe operation of the crane, hoist, lifting device, or other material handling equipment that utilizes the radio control
- Know how to keep the operator and other people clear of lifted loads and to avoid “pinch” points
- Continuously watch and monitor status of lifted loads
- Know and follow cable and hook inspection procedures
- Know and follow the local lockout and tagout procedures when servicing radio controlled equipment
- Know and follow all applicable operating and maintenance manuals, safety procedures, regulatory requirements, and industry standards and codes

The operator shall not:

- Lift or move more than the rated load
- Operate the material handling equipment if the direction of travel or function engaged does not agree with what is indicated on the controller
- Use the crane, hoist or lifting device to lift, support or transport people
- Lift or carry any loads over people

- Operate the crane, hoist or lifting device unless all persons, including the operator, are and remain clear of the supported load and any potential pinch points
- Operate a crane, hoist or lifting device when the device is not centered over the load
- Operate a crane, hoist or lifting device if the chain or wire rope is not seated properly in the sprockets, drum or sheave
- Operate any damaged or malfunctioning crane, hoist, lifting device or other material handling equipment
- Change any settings or controls without authorization and proper training
- Remove or obscure any warning or safety labels or tags
- Leave any load unattended while lifted
- Leave power on the radio controlled equipment when the equipment is not in operation
- Operate any material handling equipment using a damaged controller because the unit may be unsafe
- Operate manual motions with other than manual power
- Operate radio controlled equipment when low battery indicator is on

WARNING

THE OPERATOR SHOULD NOT ATTEMPT TO REPAIR ANY RADIO CONTROLLER. IF ANY PRODUCT PERFORMANCE OR SAFETY CONCERNS ARE OBSERVED, THE EQUIPMENT SHOULD IMMEDIATELY BE TAKEN OUT OF SERVICE AND BE REPORTED TO THE SUPERVISOR. DAMAGED AND INOPERABLE RADIO CONTROLLER EQUIPMENT SHOULD BE RETURNED TO MAGNETEK FOR EVALUATION AND REPAIR. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

1.4 PRE-OPERATION TEST

At the start of each work shift, or when a new operator takes control of the crane, operators should do, as a minimum, the following steps before making lifts with any crane or hoist:

Test all warning devices.

Test all direction and speed controls.

Test the receiver emergency stop.

WARNING

BEFORE OPERATING THE RECEIVER, FAMILIARIZE YOURSELF WITH ALL SAFETY INFORMATION IN THIS MANUAL, APPROPRIATE MANUAL SUPPLEMENTS AND ANY OTHER LOCAL, STATE, OR FEDERAL RULES OR REGULATIONS ALREADY IN EXISTENCE. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

WARNING

PRIOR TO OPERATING EQUIPMENT WITH THIS RADIO CONTROL SYSTEM, THE EQUIPMENT BEING CONTROLLED SHOULD BE INSPECTED FOR ANY DAMAGE. DO NOT OPERATE DAMAGED EQUIPMENT. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

WARNING

THIS RADIO CONTROL EQUIPMENT CONTAINS RADIO TRANSMITTERS AND RECEIVERS THAT RADIATE RADIO FREQUENCY ELECTROMAGNETIC WAVES. THIS EQUIPMENT HAS BEEN TESTED AND IS IN COMPLIANCE WITH STANDARDS EN 301 489-1 AND EN 301 489-3. ADDITIONALY, THE 433MHZ IS IN COMPLIANCE WITH STANDARD EN 300 220-2 AND THE 2.4GHZ IS IN COMPLIANCE WITH STANDARD EN 300 228-2. TO LIMIT THE OPERATORS EXPOSURE TO ELECTROMAGNETIC RADIATION AND ENSURE THE BEST POSSIBLE OPERATION OF THE EQUIPMENT, THE OPERATOR SHOULD AVOID PLACING ANY BODY PARTS NEAR OR IN CONTACT WITH THE UNIT'S ANTENNA.

WARNING

THIS RADIO CONTROLLER IS EQUIPPED WITH AN INFRARED TRANSMITTER. THE OPERATOR SHOULD BE AWARE OF THESE RISKS AND AVOID LOOKING DIRECTLY INTO THE INFRARED TRANSMITTER DURING OPERATION. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN INJURY.

WARNING

SOME EQUIPMENT THAT CAN BE INTERFACED WITH THIS RADIO CONTROLLER WILL HAVE MANUAL CONTROLS ALONG WITH THE RADIO CONTROLS. THE OPERATOR SHOULD BE PROPERLY QUALIFIED TO OPERATE THE EQUIPMENT WITH MANUAL CONTROLS. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

WARNING

THE RADIO CONTROLLED EQUIPMENT OPERATOR IS RESPONSIBLE FOR THE SAFE OPERATION OF THE EQUIPMENT IN ALL ENVIRONMENTAL CONDITIONS. WHEN OPERATING THE EQUIPMENT, THE OPERATOR SHOULD ALWAYS SEEK A SAFE POSITION FROM WHICH TO OPERATE THE EQUIPMENT. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

WARNING

SOME EQUIPMENT THAT CAN BE CONTROLLED WITH THIS RADIO CONTROLLER WILL HAVE HIGH LEVELS OF ACOUSTIC NOISE. THE OPERATOR SHOULD BE AWARE OF THESE RISKS AND WEAR PROPER PROTECTIVE GEAR, INCLUDING HEARING PROTECTION, TO MINIMIZE THE RISK OF INJURY.

WARNING

SOME EQUIPMENT THAT CAN BE INTERFACED WITH THIS RADIO CONTROLLER WILL HAVE ENGINE EXHAUST FUME HAZARDS. THE OPERATOR SHOULD BE AWARE OF THESE RISKS AND SHOULD NOT OPERATE THE RADIO CONTROLLER IN AN ENVIRONMENT WHERE THERE IS AN INSUFFICIENT SUPPLY OF FRESH AIR. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

WARNING

THE RADIO CONTROLLED EQUIPMENT OPERATOR IS RESPONSIBLE FOR THE SAFE HANDLING OF ALL LOADS IN ALL ENVIRONMENTAL CONDITIONS. WHEN OPERATING THE EQUIPMENT IN LOW LIGHT CONDITIONS, THE OPERATOR SHOULD ENSURE THAT THE EQUIPMENT CAN BE SAFELY OPERATED AND ALL INDICATORS ON THE EQUIPMENT AND RADIO CONTROLS CAN BE SEEN. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

WARNING

THE RADIO CONTROLLED EQUIPMENT OPERATOR IS RESPONSIBLE FOR THE SAFE HANDLING OF ALL LOADS IN ALL ENVIRONMENTAL CONDITIONS. WHEN OPERATING THE EQUIPMENT IN WINDY CONDITIONS, THE OPERATOR SHOULD ENSURE THAT THE EQUIPMENT CAN BE SAFELY OPERATED AND LOAD HAS A SAFE PLACE TO BE SET IN THE EVENT OF STRONG WIND GUSTS. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

2.0 MHR RECEIVER INSTALLATION

WARNING

PRIOR TO INSTALLATION AND OPERATION OF THIS EQUIPMENT, MAGNETEK SHOULD BE CONSULTED TO ASSESS THE OVERALL RISKS IN OPERATING THE EQUIPMENT INTERFACED. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

WARNING

SOME EQUIPMENT THAT CAN BE INTERFACED WITH THIS RADIO CONTROLLER WILL HAVE HIGH LEVELS OF ACOUSTIC NOISE. THE INSTALLER SHOULD BE AWARE OF THESE RISKS AND INSTALL THE RADIO CONTROLLER IN A MANNER THAT MINIMIZES THE IMPACT THESE ACOUSTIC HAZARDS WILL HAVE ON THE RADIO CONTROL EQUIPMENT AND THE OPERATORS UTILIZING THIS EQUIPMENT. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

WARNING

DURING ACTIVATION OF THE MACHINE STOP SWITCH ON THE RADIO CONTROLLER, THE CONTROLLED MACHINE MAY HAVE COMPONENTS THAT WILL REMAIN IN MOTION. THE INSTALLER SHOULD MINIMIZE THESE RISKS WITH BRAKES OR OTHER DEVICES TO ENSURE THAT ALL PARTS OF THE EQUIPMENT IS PUT INTO A SAFE STATE DURING A MACHINE STOP SHUT DOWN. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

WARNING

POWER SUPPLY FAILURE CAN LEAD TO UNSAFE CONDITIONS IN SOME EQUIPMENT BEING CONTROLLED BY THE RADIO CONTROLLER. THE INSTALLER SHOULD BE AWARE OF THESE RISKS AND INSTALL THE RADIO CONTROLLER IN A MANNER THAT MINIMIZES THE IMPACT A POWER SUPPLY FAILURE WILL HAVE ON RADIO CONTROLLED EQUIPMENT. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

WARNING

UNSTABLE LOADS OR EQUIPMENT CAN LEAD TO UNSAFE CONDITIONS IN SOME EQUIPMENT. THE INSTALLER SHOULD BE AWARE OF THESE RISKS AND INSTALL THE RADIO CONTROLLER IN A MANNER THAT MINIMIZES UNSTABLE EQUIPMENT OR LOAD CONDITIONS. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

WARNING

SOME EQUIPMENT THAT CAN BE INTERFACED WITH THIS RADIO CONTROLLER WILL HAVE MANUAL CONTROLS INSTALLED. THE INSTALLER SHOULD BE PROPERLY QUALIFIED TO INSTALL MANUAL CONTROLS AND SHOULD BE AWARE OF RISKS IN UTILIZING RADIO AND MANUAL CONTROLS AT THE SAME TIME ON THE EQUIPMENT. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

WARNING

OVERLOADING THE EQUIPMENT CAN LEAD TO HAZARDOUS CONDITIONS IN SOME EQUIPMENT. THE INSTALLER SHOULD BE AWARE OF THESE RISKS AND INSTALL THE RADIO CONTROLLER IN A MANNER THAT MINIMIZES EQUIPMENT OVERLOADING CONDITIONS. MAGNETEK'S RADIO CONTROLLER CAN BE CONFIGURED AND/OR INTEGRATED TO MINIMIZE OVERLOADING CONDITIONS. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

2.1 PRE-INSTALLATION

1. Transmitter and receiver access code and channel must match before the system will communicate.
2. Be aware of other radio channels in the surrounding area; set your system to a unique channel.
3. Make sure that your equipment is working properly in manual mode prior to system installation.
4. Make sure the power to the receiver is the correct DC voltage.
5. Disconnect equipment power prior to system installation.

2.2 MECHANICAL DRAWINGS

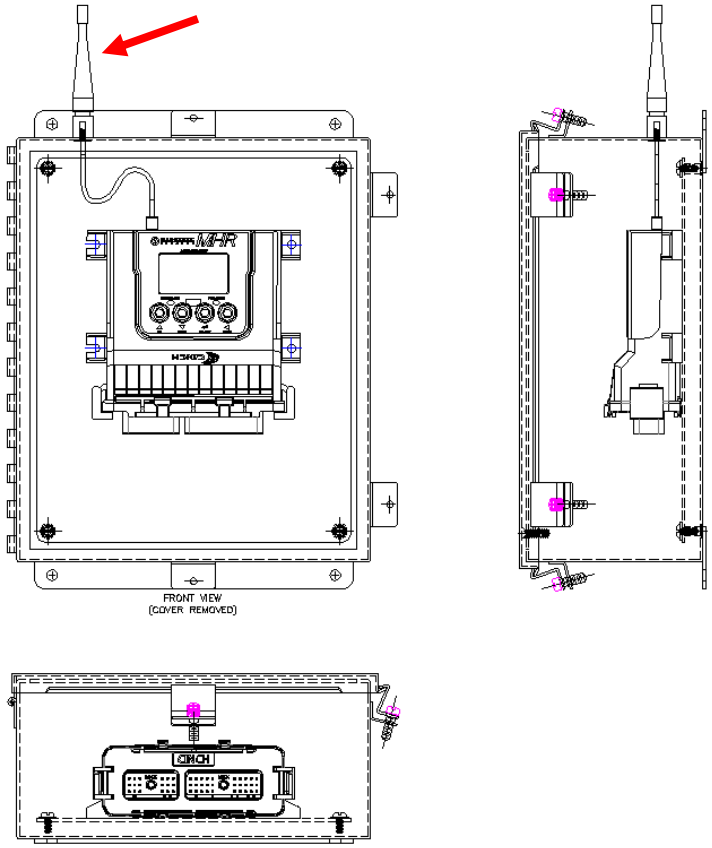


Figure 01: Remote Antenna (marked in red)

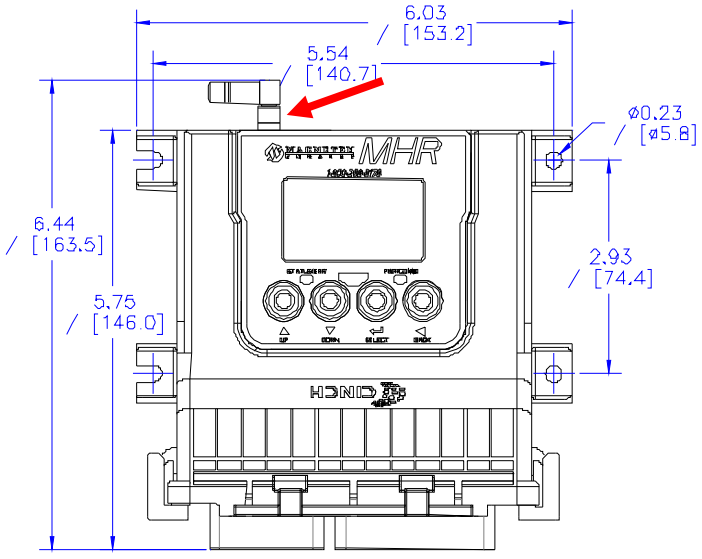


Figure 02: MHR with external antenna (red)

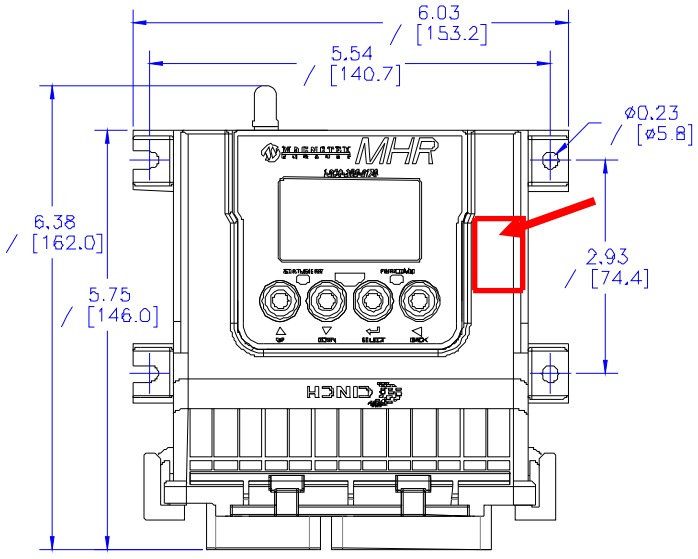


Figure 03: MHR with internal antenna (red)

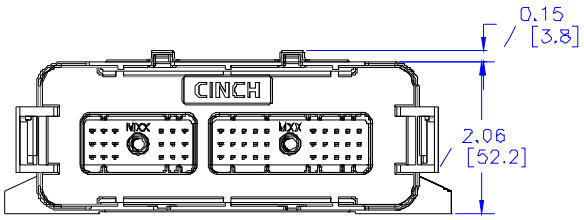


Figure 04: MHR with Con1 and Con2 connectors

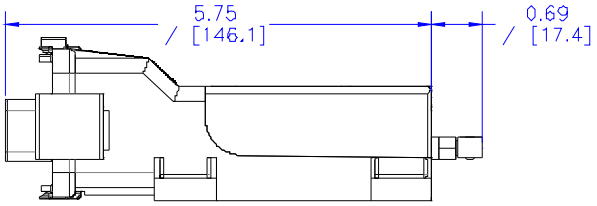


Figure 05: MHR Side View

2.3 INSTALLATION

1. Determine the location of your antenna from Figures 01-03 (antenna is designated with red arrow). **Be sure to mount receiver antenna in direct line-of-sight of operator and free from all obstructions.**
2. Do not mount receiver near high levels of electric noise, such as an unshielded variable frequency drive, as it may cause minor interference.
3. Allow adequate room for mounting the receiver. Make sure to allow a minimum of 5" between connector and nearest surface to allow for cable harness connections.
4. For best reception and to help protect connectors from moisture and water damage, mount the receiver in an upright position. Mount with back flush against a flat surface to protect vents from spray.
5. If obstructions can't be cleared, or unit must be mounted inside a metal enclosure, the remote antenna should be used (see Figure 01).
6. Do not enclose antenna in steel. For best reception, keep all metal objects away from the antenna. **Consult the factory for more information regarding your application.**
7. When mounting the receiver the unit should be torqued no more than 10-12 in-lbs.

2.4 PIN OUT AND DIAGRAM DEFINITIONS

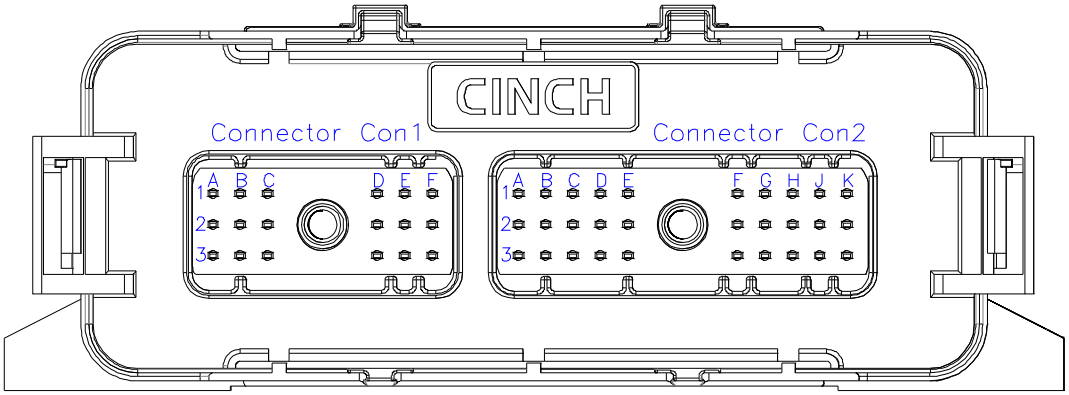


Figure 06: Pin out diagram

Table 1

Con1	Name	Functions
A1	CANH1	CAN-bus 1 Port
A2	USB+	USB Port
A3	USB-	USB Port
B1	CANH2	CAN-bus 2 Port
B2	CANL2	CAN-bus 2 Port
B3	CANL1	CAN-bus 1 Port
C1	Stop 2	Machine Stop output/Digital Output
C2	Vref Com	Common for Voltage Supply
C3	+5V Vref	+5V Voltage Supply (100mA max)
D1	Stop 1	Machine Stop output
D2	-Vbattery	-V Bat
D3	+Vbattery	+V Bat
E1	AD1	Analog/Digital In1
E2	AD2	Analog/Digital In2
E3	AD3	Analog/Digital In3
F1	AD4	Analog/Digital In4
F2	AD5	Analog/Digital In5
F3	AD6	Analog/Digital In6

Table 2

Cinch Connector Information	Cinch pt#	Magnetek Pt#
Mating Connector for Con1 (18 pos)	581-01-18-023	01-525-0054E
Mating Connector for Con2 (30 pos)	581-01-30-029	01-525-0053E
Crimps (14-18 AWG)	425-00-00-873/PCS	01-550-0056E
Sealing plug	581-00-00-011	20-990-0179E

Table 3

Con2	Name	Functions
A1	IO1	CC Out/PWM Out/Dig Out/Dig In 1
A2	IO2	CC Out/PWM Out/Dig Out/Dig In 2
A3	Return 1	Return for Out 1&2
B1	IO3	CC Out/PWM Out/Dig Out/Dig In 3
B2	IO4	CC Out/PWM Out/Dig Out/Dig In 4
B3	Return 2	Return for Out 3&4
C1	IO5	CC Out/PWM Out/Dig Out/Dig In 5
C2	IO6	CC Out/PWM Out/Dig Out/Dig In 6
C3	Return 3	Return for Out 5&6
D1	IO7	CC Out/PWM Out/Dig Out/Dig In 7
D2	IO8	CC Out/PWM Out/Dig Out/Dig In 8
D3	Return 4	Return for Out 7&8
E1	IO9	CC Out/PWM Out/Dig Out/Dig In 9
E2	IO10	CC Out/PWM Out/Dig Out/Dig In 10
E3	Return 5	Return for Out 9&10
F1	IO11	CC Out/PWM Out/Dig Out/Dig In 11
F2	IO12	CC Out/PWM Out/Dig Out/Dig In 12
F3	Return 6	Return for Out 11&12
G1	IO13	CC Out/PWM Out/Dig Out/Dig In 13
G2	IO14	CC Out/PWM Out/Dig Out/Dig In 14
G3	Return 7	Return for Out 13&14
H1	IO15	CC Out/PWM Out/Dig Out/Dig In 15
H2	IO16	CC Out/PWM Out/Dig Out/Dig In 16
H3	Return 8	Return for Out 15&16
J1	-Vbattery	-V Bat
J2	-Vbattery	-V Bat
J3	-Vbattery	-V Bat
K1	Vbattery	+V Bat
K2	Vbattery	+V Bat
K3	Vbattery	+V Bat

+Vbattery (CON1 D3 and CON2 K1, K2, K3)
The MHR is designed to work in any 12-24VDC nominal (9-36VDC max) powered equipment. The +Vbattery pins should be connected to the positive terminal of the machine power supply through an approved Emergency Stop device. Additionally, MHR +Vbattery pins should be protected by a 30A fast blow fuse. All +Vbattery pins must be connected.

-Vbattery (CON1 D2 and CON2 J1, J2, J3)
The -Vbattery connections must be made directly to the negative supply and not to a chassis ground. All -Vbattery pins must be connected.

Machine Stop (CON1 C1, F3)
In order to ensure maximum safety of the equipment controlled by the MHR, redundant Machine Stop outputs are provided. Each can supply a current of up to 2 Amps. In the event of an unsafe condition, such as loss of communications, both machine stops will be enabled.

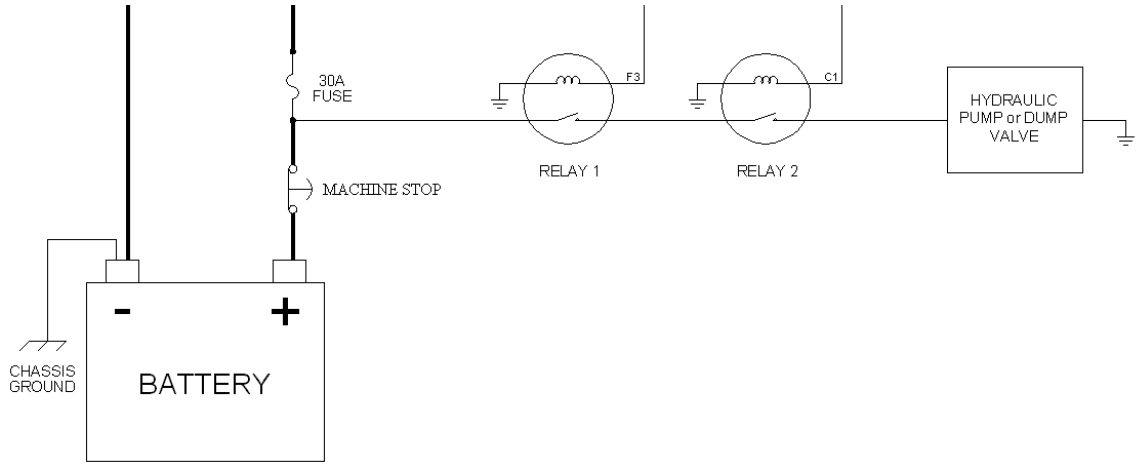


Figure 07: MHR Machine Stop Wiring

Additionally, make sure that a Machine Stop is provided elsewhere on the equipment in which the MHR is installed in order to comply with all applicable Machinery Directives.

The MHR is equipped with a battery backup for the real time clock and calendar. Therefore, power can be completely disconnected from the MHR when not in use.

NOTE: The backup battery is internal to the MHR and should only be replaced by the factory.

USB (CON1 A2, A3)
It is recommended that the two wires, USB+ (pin A2) and USB- (pin A3), be a twisted pair with 15 twists/meter. Use Vref Com (pin C2) for the ground connection. If you use a chassis or some other connection for the ground connection of the USB, you could create a damaging ground loop to your computer system. When plugging in an MHR receiver to a computer system, it is strongly recommended that a USB isolation hub, like Magnetek part 195-50645, is used between the MHR and the computer system.

Vref (CON1 C3)
Vref is a 5V, 100mA max supply provided for the user to power sensors or peripheral interface devices used with the MHR. To ensure a clean power source, do not use the chassis as the negative terminal; use pin C2 Vref Com instead.

Analog/Digital Inputs (CON1, E1, E2, E3, F1, F2, F3)
These six pins can be configured as either analog or digital inputs. The input source used on these pins must be able to drive 40K Ohm input impedance.

Analog voltage range is from 0 to 12V. The analog input utilizes a 10bit analog to digital converter. The digital voltage range is as follows: inputs less that 2V are a digital 0; inputs greater than 3V are a digital 1; the output remains unchanged for inputs between 2 and 3V.

Assemblies with part numbers in the 178-01790-xxxx range have two 4-20mA analog input pins: F2 and F3 on CON1. These can only be utilized as analog inputs and cannot be used as digital inputs. If support for digital inputs is required, then the analog pins that support 0 to 12V should be used.

CAN1 (CON1 A1, B3) CAN2 (CON1 B1, B2)
There are 2 independent CAN-bus ports on the MHR. Each has a software settable termination resistor internal to the MHR. The termination resistor should only be enabled if the MHR is the last device on that end of the CAN-bus and there is no external terminating resistor present.

Current Compensated Outputs, PWM Output, and Digital IO (CON2 A1-H3)
Connector 2 pins A1-H3 can be configured in many different ways. However, they can only be used to drive the high side of any load.

For any Current Compensated output, the high side of the load should be connected to the IO pin and the low side of the load should be connected to the return pin (see Figure 08).

For PWM and digital outputs the high side of the load is connected to the IO pin and the low side can be tied to a chassis ground (see Figure 09) or to the return pin on the MHR to alleviate the need for an external diode when driving inductive loads (see Figure 08).

Keep in mind that the total current for any single pin is limited to 3 Amps. Therefore, if both IO1 and IO2 were configured as digital outputs and had their low sides returned to the MHR return1 pin, the sum of the current on IO1 and IO2 must not exceed 3 Amps. If 3A is needed on both IO1 and IO2, the low side of the load must be connected to a chassis ground, where an external diode is needed.

See Con2 table for IO/Return Line pairs.

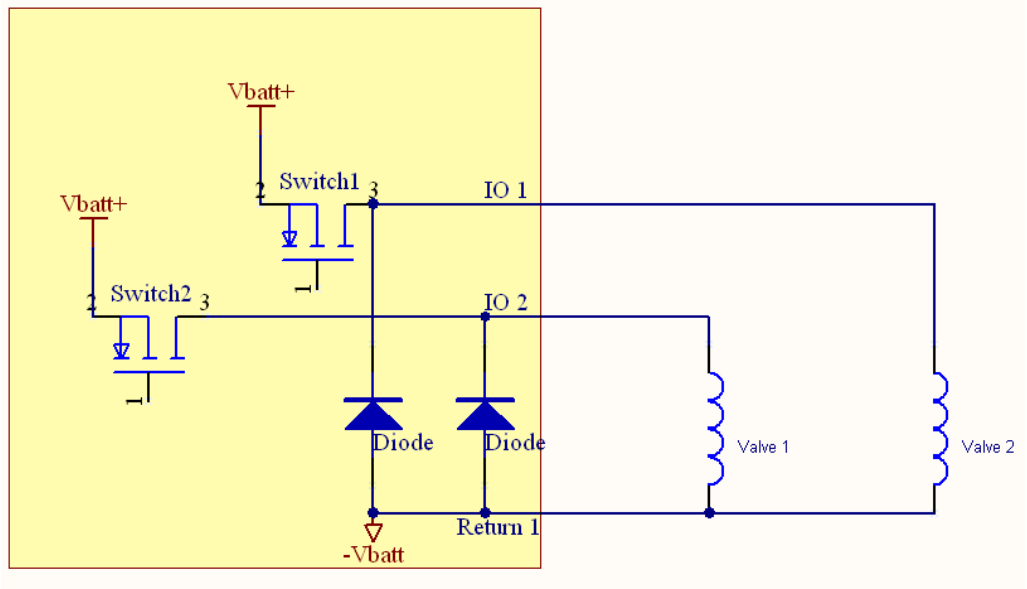


Figure 08: MHR driving Current Compensated or PWM load using Return Pin and internal diodes

NOTE: This is a simplified schematic.

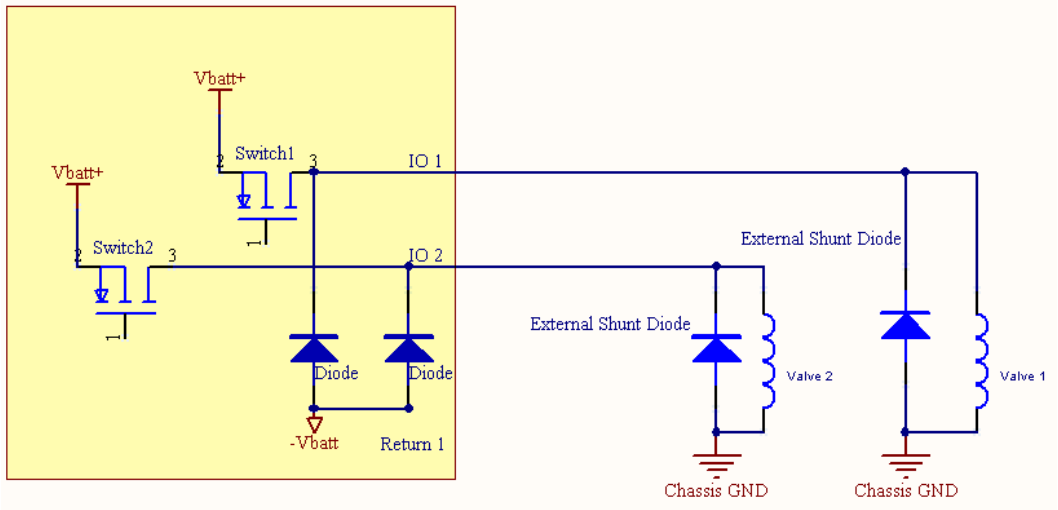


Figure 09: MHR PWM or Digital ON/OFF load using external ground and external diodes

NOTE: This is a simplified schematic.

PWM and digital outputs are not required to make use of the return pin. However, if the return pin is utilized, use of an external diode is not needed for inductive loads.

NOTE: When the return pin is not utilized for PWM or digital outputs, a clamping diode must be placed between the source and the output to provide protection against voltage transients. The clamping diode should be placed as close to the load as possible. Magnetek recommends the use of Magnetek P/N 14-105-0021E (clamping diode, 3A/1000V) in this situation, but depending on the load, other clamping diodes might be used instead.

When configured as frequency or digital inputs, the IOs have 20K Ohm input impedance. The return pin is not used in conjunction with an input.

In total, the MHR can be configured for:

- Up to 8 bi-directional Current Compensated outputs (pairs are interlocked to prevent simultaneous motion)
- Up to 8 bi-directional PWM outputs (pairs are interlocked to prevent simultaneous motion)
- Up to 16 single directional digital ON/OFF outputs
- Up to 16 single directional digital ON/OFF inputs

NOTE: The total number of IOs on the unit is limited by its configuration, i.e. if the unit has 6 bi-directional outputs, there will only be room for 4 digital ON/OFF outputs.

NOTE: When using PWM, the MHR supports PWM frequencies of 75 to 1000MHz for closed loop systems and 33 to 1000MHz on open loop systems. Contact the factory if PWM frequencies outside of these ranges are desired.

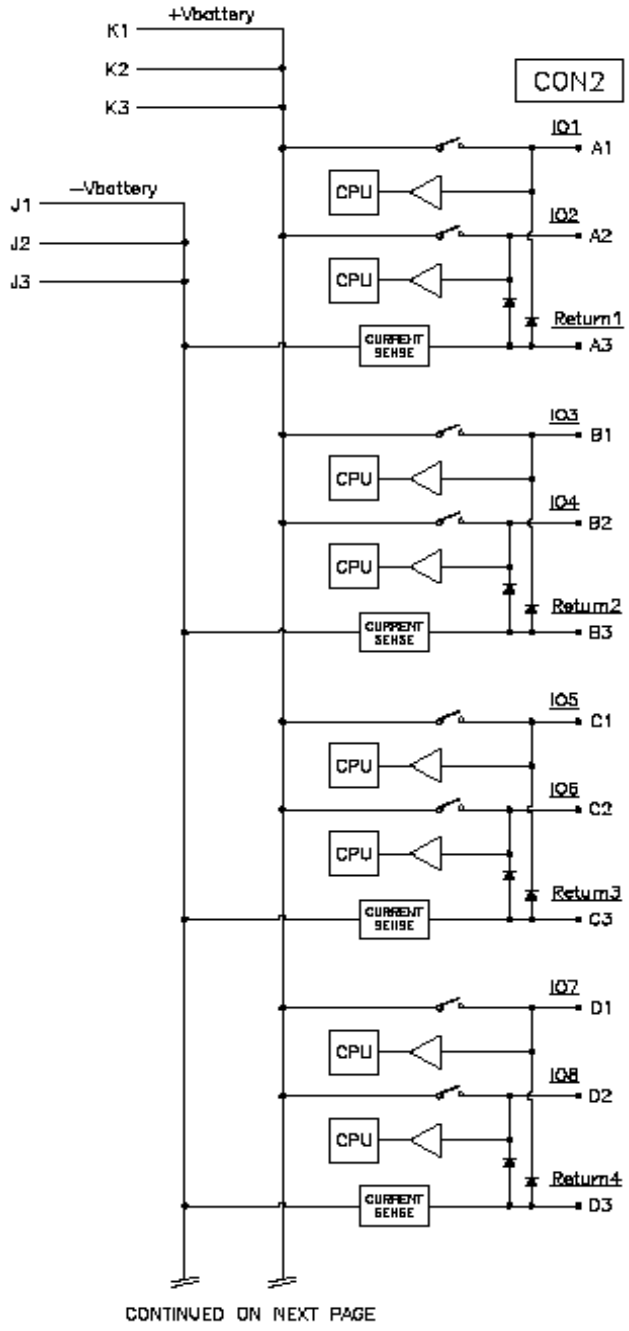
NOTE: In certain applications where the hydraulic valves utilize a negative voltage spike to close/turn off the valve quickly (such as applications utilizing Parker Pulsar valves), Magnetek offers the following MHR assemblies:

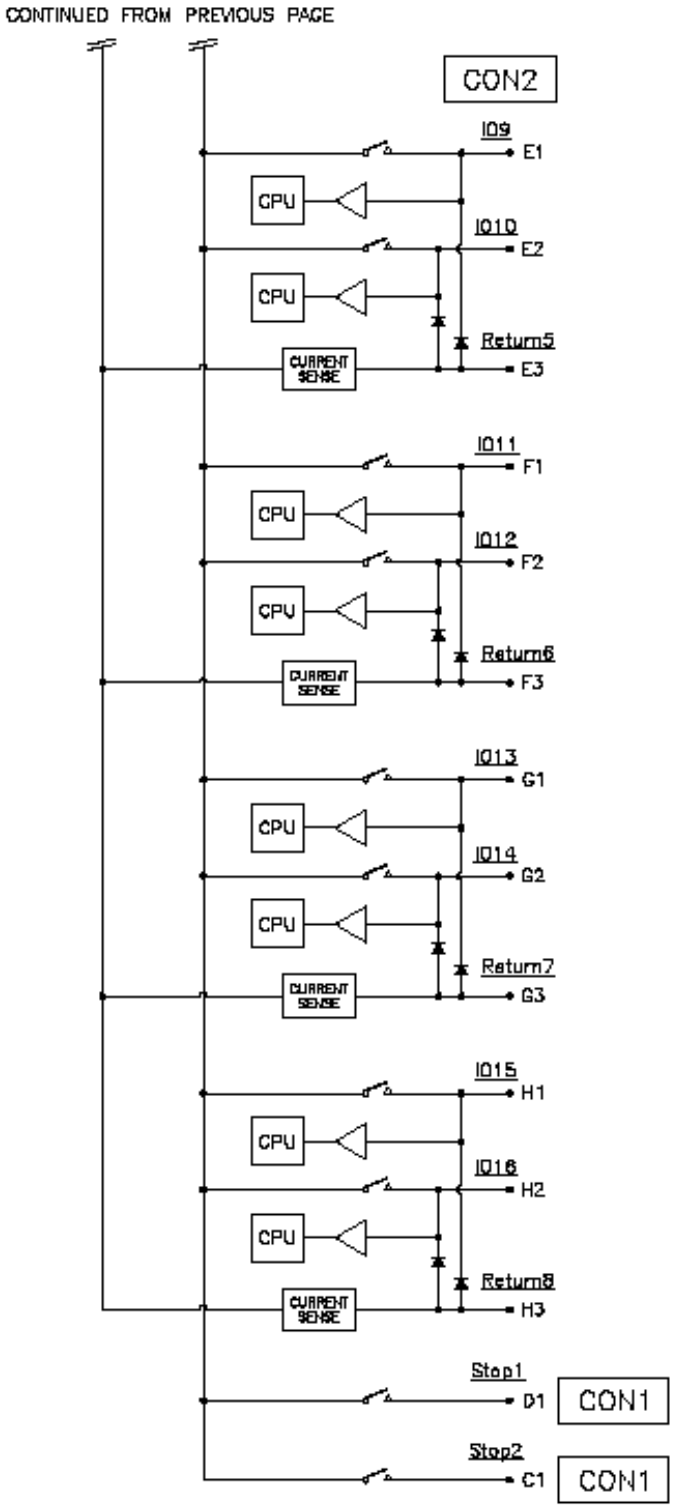
433MHz – 198-00149-1000
2.4GHz, 50mW – 198-00149-2000
2.4GHz, 125mW – 198-00149-3000

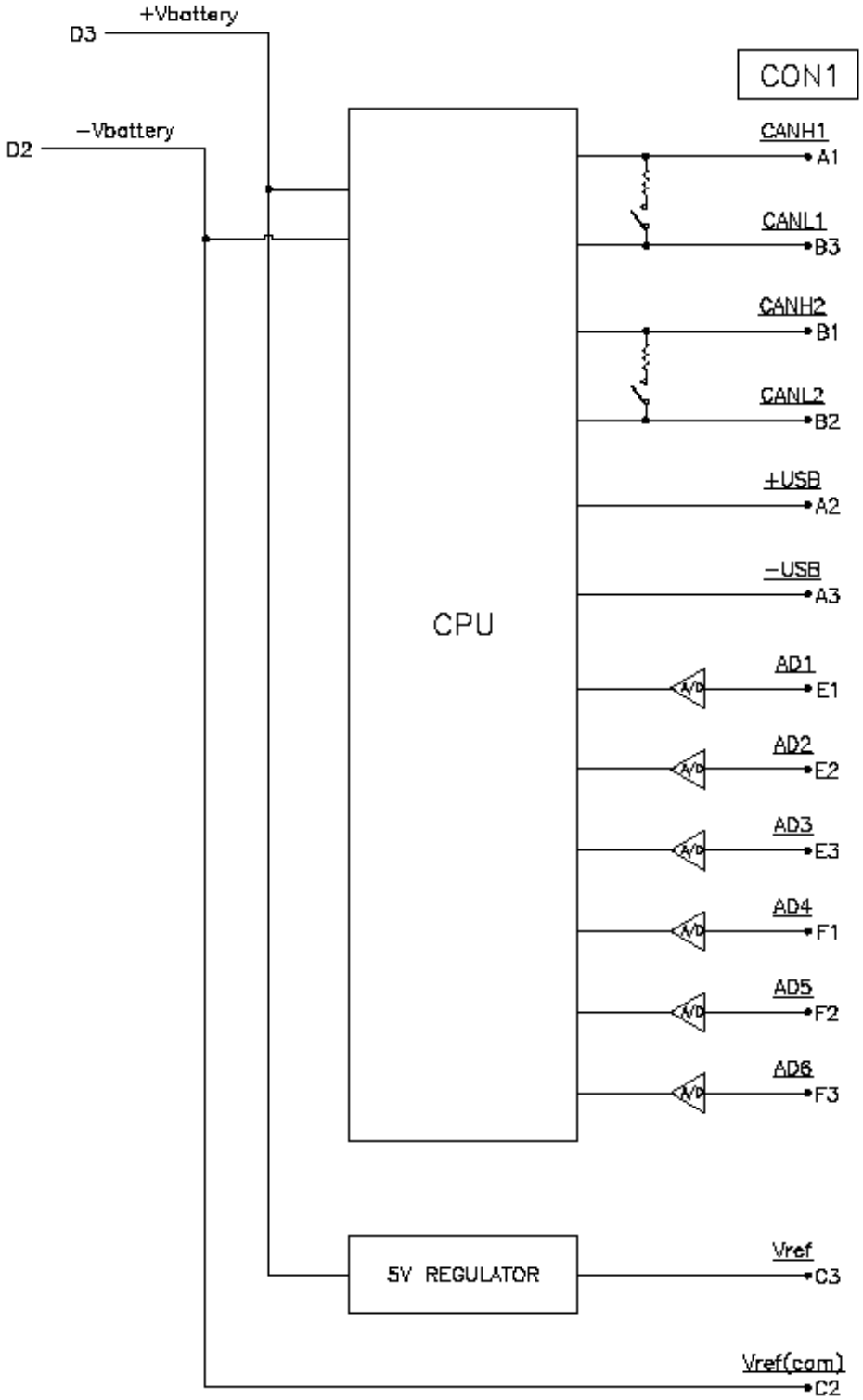
All operational features are the same, but the internal circuits have been optimized for use with the Parker Pulsar valves.

2.5 MHR RECEIVER BLOCK DIAGRAM

NOTE: Connections are labeled by which side the connector is on the MHR receiver, i.e. CON1 is on the left side, CON2 is on the right side. See Figure 6 in Section 2.4 for more detail.


+Vbattery
K1
K2
K3
CON2
IO1
A1
CPU
IO2
A2
CPU
Return1
CURRENT SENSE
A3
–Vbattery
J1
J2
J3
IO3
B1
CPU
IO4
B2
CPU
Return2
CURRENT SENSE
B3
IO5
C1
CPU
IO6
C2
CPU
Return3
CURRENT SENSE
C3
IO7
D1
CPU
IO8
D2
CPU
Return4
CURRENT SENSE
D3
CONTINUED ON NEXT PAGE


CONTINUED FROM PREVIOUS PAGE
CON2
IO9
E1
CPU
IO10
E2
CPU
Return5
CURRENT SENSE
E3
IO11
F1
CPU
IO12
F2
CPU
Return6
CURRENT SENSE
F3
IO13
G1
CPU
IO14
G2
CPU
Return7
CURRENT SENSE
G3
IO15
H1
CPU
IO16
H2
CPU
Return8
CURRENT SENSE
H3
Stop1
D1
CON1
Stop2
C1
CON1


+Vbattery
D3
−Vbattery
D2
CON1
CPU
CANH1
A1
CANL1
B3
CANH2
B1
CANL2
B2
+USB
A2
−USB
A3
AD1
E1
AD2
E2
AD3
E3
AD4
F1
AD5
F2
AD6
F3
5V REGULATOR
Vref
C3
Vref(com)
C2

3.0 CONFIGURING THE MHR

The Setup Mode can be used to edit configuration settings so that the MHR can be used in many different scenarios.

NOTE: No parameter changes will take effect until the user has selected 'Save and Exit' from the Setup Mode.

3.1 ENTERING SETUP MODE

To enter the setup mode, hold the *UP* and *BACK* buttons at the same time. If the password feature is enabled on the MHR, you will be prompted for a password prior to entering setup mode.

Example for entering setup mode on the MHR is as follows:

Press and hold UP and BACK together at the same time for 5 seconds. When the buttons are properly pressed, the Enter Password screen or Setup Mode menu screen will be displayed.

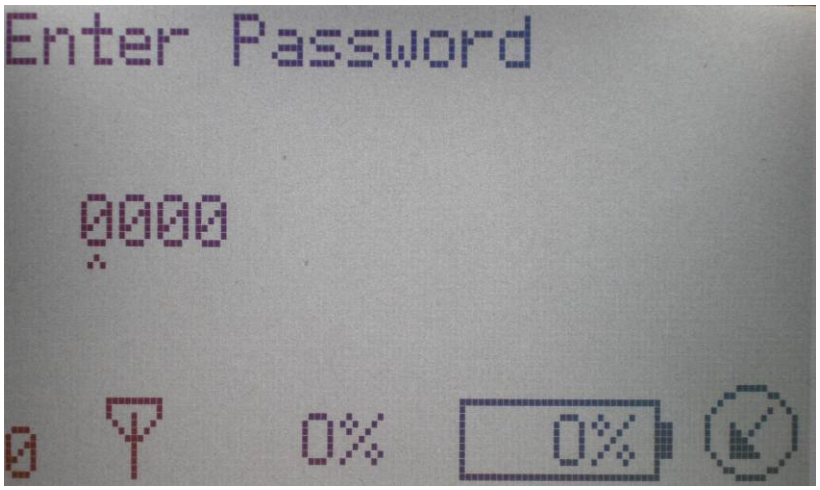


Figure 10: Enter Password screen

Enter Password Screen: Enter the password one digit at a time. The password can range from 0000 to 9999.

Use the UP and DOWN arrows to change the values and SELECT and BACK to cycle through each digit.

After the last digit is entered on the far right side of the password enter screen, press SELECT to enter setup menu.

*NOTE: The factory default password is **3579.***

For example, entering the factory default password in the password entry screen is as follows:

Press UP , UP , UP and the screen should read 3000

Press SELECT to move the highlight over to the next digit to the right.

Press UP , UP , UP , UP , UP and the screen should now read 3500.

Press SELECT to move the highlight over to the next digit to the right.

Press UP , UP , UP , UP , UP , UP , UP , and the screen should now read 3570.

Press SELECT to move the highlight over to the next digit to the right.

Press UP , UP , UP , UP , UP , UP , UP , UP , UP and the screen should now read 3579.

Press SELECT and the MHR will enter the setup menu.

NOTE: If the wrong password is entered, the MHR will go back to its normal operation screen. The procedure to enter setup mode will have to be restarted to get back to the password entry screen.

3.2 SETUP MODE MENU

To cycle through the list use the UP and DOWN buttons. To enter a submenu, use the SELECT button. The BACK button will take the user back to the Setup Mode menu

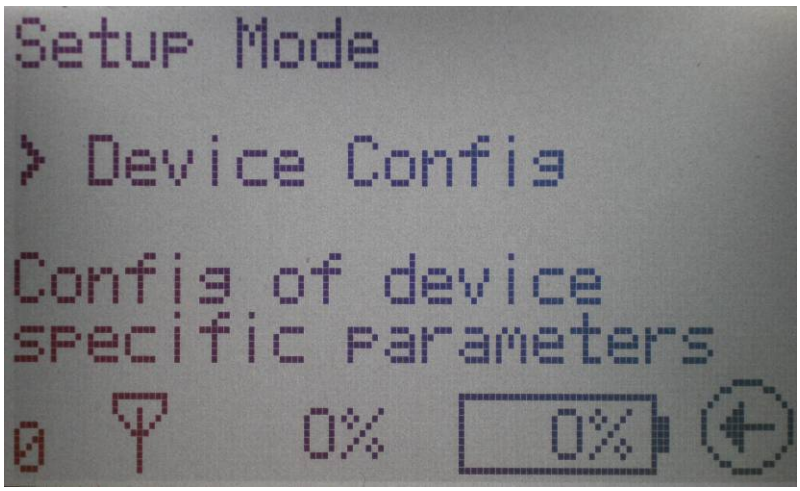


Figure 11: Setup Mode Main Menu

Setup Mode Menu: This screen allows the user to select which Configuration Menu to enter. A brief description of each menu is also listed. The choices are:

- **DEVICE CONFIG**
  - RF Channel
  - Access Code
  - Password Enable
  - Time/Date
  - RF Antenna
  - Set Default Values
- **IO CONFIG**
  - I/O type
  - Min/Max current
  - Ramping
  - Min/Max Duty Cycle
  - PWM frequency
- **CAN CONFIG**
  - Number
  - Baud Rate
  - CAN settings
- **PROJ SPEC OPTIONS –** user adjustable options per customer request
- **UNIT STATUS**
  - Access Code
  - TX ID
  - Channel
  - Time/Date
  - Temp
- **SOFTWARE VERSIONS** – displays installed software version numbers
- **SAVE AND EXIT** - Save changes and continue to normal operation
- **EXIT WITHOUT SAVE** – Exit but discard changes

Example of how to navigate the setup menu to the Unit status screen:

Once in the main menu for the setup mode,

Press ▼ DOWN, ▼ DOWN, ▼ DOWN and the menu selection should read “Unit Status”

Press ↵ SELECT to enter the “Unit Status” sub-menu.

There are no user selectable options in the unit status menu screen.

When finished, press ◀ BACK to return to the main setup mode menu.

To exit the setup menu after viewing the unit status, press ▼ DOWN, ▼ DOWN, ▼ DOWN and the menu selection should read “Exit without Save”

Press ↵ SELECT to exit setup mode without saving.

NOTE: None of the changes will be saved and the device will then start up with the old configuration settings if the “EXIT WITHOUT SAVE” option is selected.

3.3 DEVICE CONFIGURATION

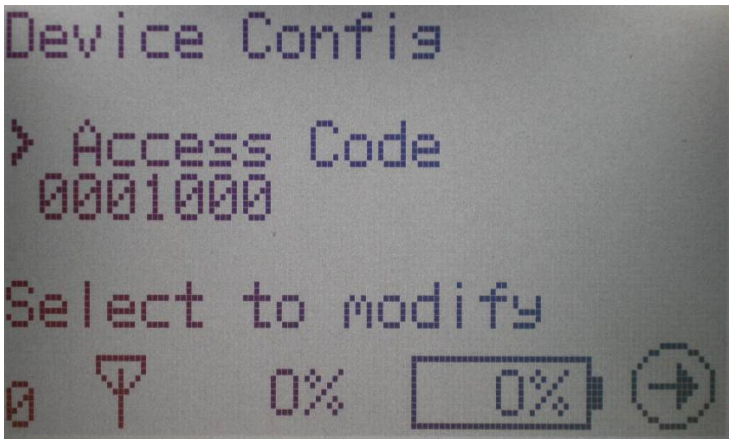


Figure 12: Device Configuration

Device Configuration: Used to set device parameters. The list includes:

- RF Channel
  This function is used to prevent interference with other radio devices. The user selectable channels for a 433MHz system are 1 through 32. The user selectable channels for a 2.4GHz system are 1 through 32.

  When the RF channel option is selected from the menu, the channels are user selectable by using the ▲ UP or ▼ DOWN buttons.

- Access Code

  The access code acts as the receiver address. The receiver will only listen to transmitters with the same address.

  NOTE: The transmitter must be set with the same access code as the receiver to properly communicate with each other.

WARNING

THE ACCESS CODES IN THE RECEIVER ARE UNIQUE AND FACTORY PRESET. **DO NOT CHANGE THESE ACCESS CODES UNLESS YOU ARE REPLACING AN EXISTING RECEIVER AND ITS ACCESS CODE**. CHANGING THIS CODE COULD MAKE IT COMMON WITH ANOTHER RECEIVER ACCESS CODE, WHICH COULD MOVE OTHER EQUIPMENT. NO TWO SYSTEMS IN ANY LOCATION SHOULD EVER HAVE THE SAME ACCESS CODES. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH, AND DAMAGE TO EQUIPMENT.

  When the Access Code option is selected from the menu, the access code is user selectable by using the UP or DOWN buttons. Press SELECT to move the highlight over to the next digit to the right.

- Password

  The password is used to restrict access to the configuration menu on the MHR. Having an active password prevents accidental changes to the receiver.

  NOTE: Familiarize yourself with PASS ENABLE section before entering a password.

  NOTE: Password must be enabled in the next menu option in order to be active.

  The user can create a new password by selecting a four digit numerical password using numbers from 0 to 9. Be sure to write this password down in a safe place for future reference.

  Enter the password one digit at a time. The password can range from 0000 to 9999.

  Use the UP and DOWN buttons to change the values and SELECT and BACK buttons to cycle through each digit.

  After the last digit is entered on the far right side of the password enter screen, press SELECT to return to the setup menu.

WARNING

ALWAYS REMEMBER TO STORE THE PASSWORD IN A SECURE LOCATION FOR ACCESS IF THE PASSWORD IS LOST OR FORGOTTEN. ONCE THE RECEIVER IS PROGRAMMED WITH A PASSWORD, THERE IS NO WAY TO DEFEAT THE PASSWORD WITHOUT USING THE RCP SOFTWARE TO EITHER READ THE PASSWORD OR REPROGRAM A NEW PASSWORD.

- Pass Enable (Enable or disable the password)

  The password is used to restrict access to the configuration menu on the MHR. Having an active password prevents accidental changes to the receiver.

  NOTE: Please familiarize yourself with this section before entering a password.

  If you choose to enable the password function, you can create a new password in the PASSWORD menu option by selecting a four digit numerical password using numbers from 0 to 9. Be sure to write this password down in a safe place for future reference.

WARNING

THIS PASSWORD FUNCTION IS NOT TO BE USED AS A SECURITY DEVICE. THE PURPOSE OF THIS FUNCTION IS TO PREVENT ACCIDENTAL CHANGES TO THE RECEIVER SETTINGS. THE BEST FORM OF SECURITY IS ALWAYS TO LOCK UP THE RECEIVER WHEN NOT IN SERVICE. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

WARNING

NOT ENABLING THE PASSWORD FUNCTION ALLOWS THE RECEIVER SETTINGS TO BE MODIFIED BY ANY UNAUTHORIZED USERS. IMPROPER RECEIVER SETTINGS COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

- Date

  This menu option allows the operator to adjust the calendar date that is stored on the MHR. The date can be adjusted by using the SELECT and BACK buttons to cycle

through each digit. Use the UP and DOWN buttons to change the values of the digit selected. After the last digit is entered on the far right side of the date screen, press SELECT to return to the setup menu.

- Time

  This menu option allows the operator to adjust the time that is stored on the MHR.

  The time can be adjusted by using the SELECT and BACK buttons to cycle through each digit. Use the UP and DOWN buttons to change the values of the digit selected. After the last digit is entered on the far right side of the date screen, press SELECT to return to the setup menu.

- RF Antenna

  This menu option allows the operator to select between utilizing the internal antenna that is built into the receiver or utilize the external antenna attachment (if available).

  The options can be selected by using the UP and DOWN buttons to change the values

- Set Default Values (resets MHR settings to factory default settings)

  This menu option allows the operator to reset the MHR configuration values back to the factory shipped default values.

  The default option is NO.

  When the operator selects YES, and exits the setup menu through the save changes screen, all custom values entered will be replaced with factory default values.

  The values for the Default Values can be selected by using the UP and DOWN buttons.

3.4 IO CONFIGURATION

IO Configuration: Used to set input/output parameters. The lists of choices are:

- PWM Frequency

  This sets the Pulse Width Modulation frequency of the MHR outputs when either the Current Compensated or Open Loop PWM output types are selected.
  - When current compensated (closed loop systems) is selected in the output type, the MHR supports 75 to 1000MHz PWM frequencies.
  - When open loop PWM is selected in the output type, the MHR supports 33 to 1000MHz PWM frequencies.
  - For frequencies used outside of these ranges, please contact the factory.

To adjust the PWM frequency setting, select the PWM Frequency option and use the SELECT and BACK buttons to cycle through each digit. Use the UP and DOWN buttons to change the values of the digit selected. After the last digit is entered on the far right side of the PWM Frequency screen, press SELECT to return to the setup menu.

- Output # (There will be one for each output available on the unit)

  Use the UP and DOWN buttons to change the values of the Output # to the desired number and press the SELECT button to enter the configuration options for the output selected.

NOTE: The output can be also configured as a digital input as well as three different output types.

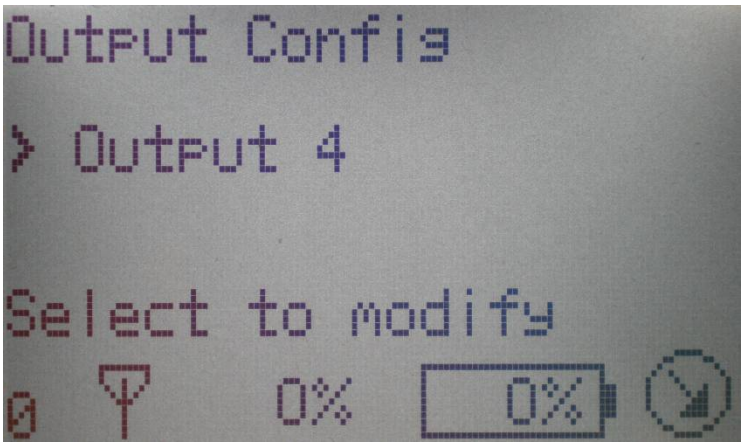


Figure 13: Output Configuration Outputs

3.4.1 INDIVIDUAL OUTPUT CONFIGURATION

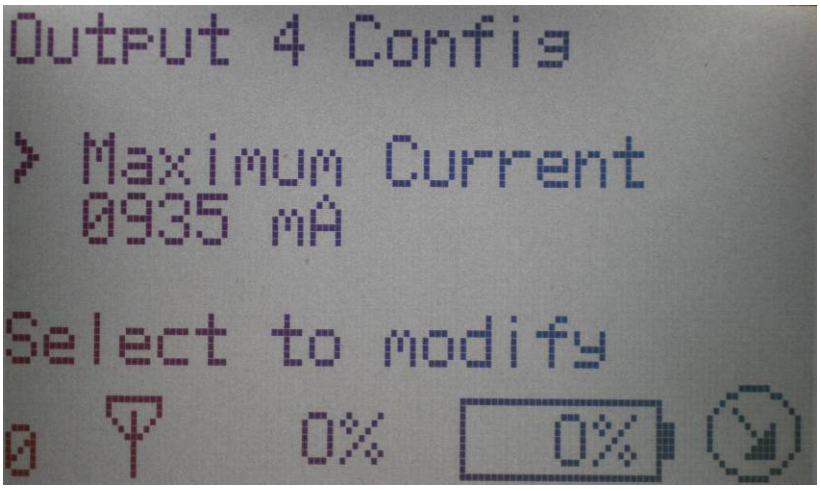


Figure 14: Individual Output Configurations

Individual Output Configuration: Once an individual output is selected, the following parameters may be changed:

- Config Type – This menu option allows the user to set the MHR outputs up for the application in which it is being used. The config type options are:
  - Unused
  - Digital Output - Momentary
  - Current Compensated (closed loop PWM)
  - Open Loop PWM
  - Digital Input
  - Digital Output - Latched

  NOTE: Select Unused to disable an output.

  When the Config Type option is selected from the menu, the configuration types are user-selectable by using the ▲ UP or ▼ DOWN buttons.

The following setting options are used to configure the selected output for the application being used and can be accessed through the individual output menus for each output number.

NOTE: The following setting options have no effect when the output Config Type is set to Digital Output or Digital Input.

- Minimum Current (Only used for Current Comp)
    - Sets the minimum output current for the selected output number.
    - The range is 100 to 3000mA.
- Maximum Current (Only used for Current Comp)
    - Sets the maximum output current for the selected output number.
    - The range is 100 to 3000mA
- Start Ramp (Only applies to Open Loop and Current Comp)
    - Sets the ramp up time for the start of the output signal being sent.
    - The range is 0 to 1000ms
- Stop Ramp (Only applies to Open Loop and Current Comp)
    - Sets the ramp down time for the output signal being sent
    - The range is 0 to 1000ms
- Min Duty Cycle (Only used for Open Loop PWM)
    - Sets the minimum duty cycle percentage
    - The range is 0 to 100%
- Max Duty Cycle (Only used for Open Loop PWM)
    - Sets the maximum duty cycle percentage
    - The range is 0 to 100%

To adjust any of the output configuration setting, select the desired output number and press the SELECT button to access the configuration menu options for the specific output number selected. Use the UP and DOWN buttons to scroll through the menu options (Maximum Current, Minimum Current, etc.). Press the SELECT button to enter the screen that adjusts the selected setting in the menu option. Use the SELECT and BACK buttons to cycle through each digit and use the UP and DOWN buttons to change the values of the digit selected.

After the last digit is entered on the far right side of the PWM Frequency screen, press SELECT to return to the selected output configuration menu.

To exit back to the main menu screen press the BACK button.

3.5 CAN CONFIGURATION

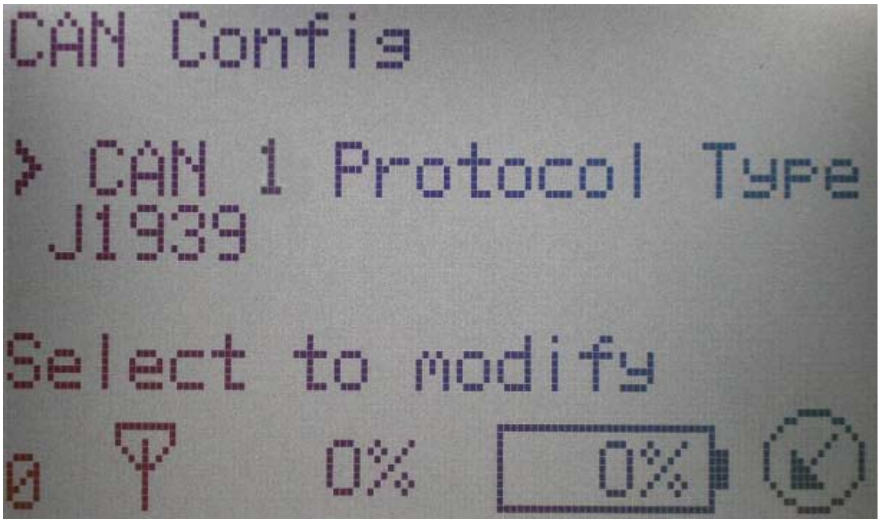


Figure 15: CAN Configuration

CAN Configuration: This screen allows the user to make changes to the CAN 1 and CAN 2 settings.

The operator can choose between adjusting the settings for CAN 1 and/or CAN 2. The two CAN networks are independent from each other.

Use the UP and DOWN buttons to change between the settings for CAN 1 and CAN 2 and press the SELECT button to enter the setting options selected.

Press the BACK button to return to the CAN setting option menu.

The following setting options are used to configure the selected CAN-bus for the application being used.

- CAN1 Protocol – This setting enables the operator to select the protocol for the CAN 1 network.
  The available protocols are as follows:
  - J1939
  - CAN Open
  - Parker ICP
  - High Country Tek DN
  - OEM Controls
- CAN 1 Baud Rate – This setting enables the operator to select the CAN 1 network communication speed
  The available Baud Rate options are:
  - 50k
  - 125k
  - 250k
  - 500k

- CAN 1 Source Addr - This is the address that the MHR will use as the source address when transmitting messages on the CAN 1 bus network.
    - 0 through 255
- CAN 1 Identifier Bit - This option allows the operator to select between an 11 bit or 29 bits identifier for the CAN 1 network
    - 11 bits
    - 29 bits
- CAN 1 Term Resistor - This option allows the user to enable/disable the internal terminating resistor.
  The options for the terminating resister are:
    - Internal
    - External

  Selecting Internal will enable the terminating resistor. Selecting External will disable the internal terminating resistor.

The options menu continues with the CAN 2 settings and they have the same options as the CAN 1 settings detailed above.

The list of the CAN 2 network options are:

- CAN 2 Protocol
- CAN 2 Baud Rate
- CAN 2 Source Addr
- CAN 2 Identifier
- CAN 2 Term Resistor

Press the BACK button to return to the CAN setting option menu.

3.6 PROJECT SPECIFIC OPTIONS

This option menu item features custom configuration options that were put onto the MHR by customer request.

Reference the project documentation that was shipped with the MHR for details or contact the factory.

3.7 UNIT STATUS

This section displays the unit status information (see Figure 16 for details).

There are no user selectable options in this menu item.

To exit the unit status screen, press the BACK button to return to the main setup menu screen.

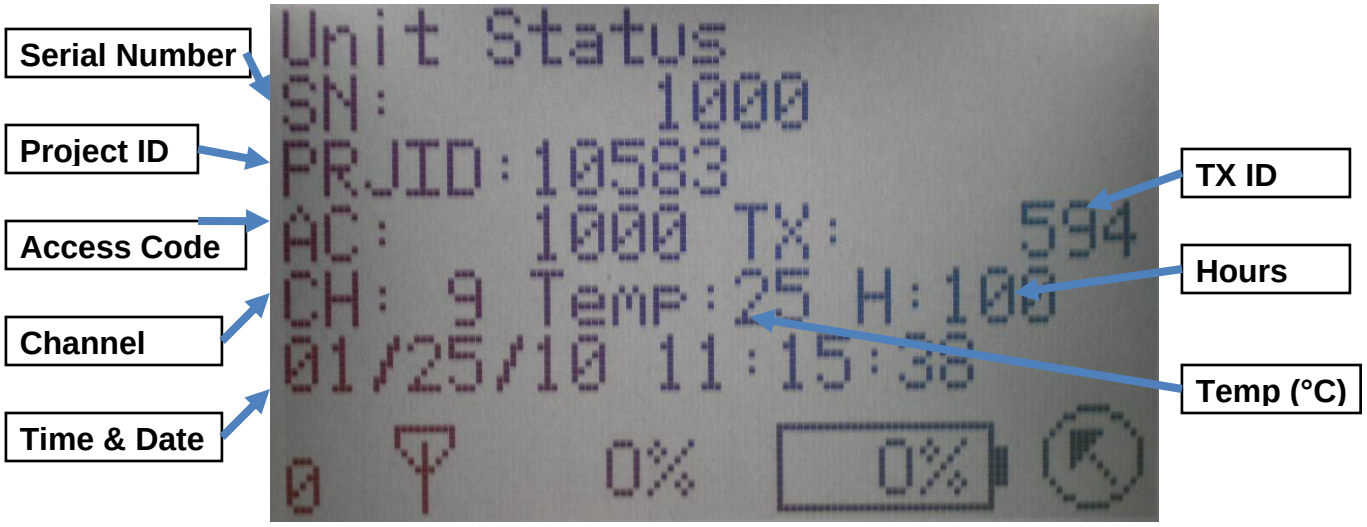


Figure 16: Unit Status

Field	Description
Serial number	Every unit has a unique serial number associated with it.
Project ID	Magnetek assigned project ID.
Access Code	Unit access code that the transmitter needs to know in order to communicate with the receiver. This is typically the same as the serial number, but can be changed.
RF Channel	The RF channel number the receiver is set to communicate on.
Time and Date	Current Time and Date.
TX ID	ID of the transmitter which is currently controlling this unit.
Hours	Number of cumulative hours the unit has been on.
Temperature	Temperature within the unit's enclosure.

3.8 SOFTWARE VERSIONS

This section displays the software versions that are active on the MHR.

There are no user selectable options in this menu item.

To exit the software version screen, press the ◀ BACK button to return to the main setup menu screen.

3.9 SAVE AND EXIT

This saves all changes and exits the Setup Mode. Upon exit, the device will start up with the new configuration settings.

3.10 EXIT WITHOUT SAVE

If the user does not wish to save any of the configuration changes made there is an Exit Without Save option. None of the changes will be saved and the device will then start up with the old configuration settings.

4.0 NORMAL OPERATION

WARNING

PRIOR TO OPERATING EQUIPMENT WITH THIS RADIO CONTROL SYSTEM, THE EQUIPMENT BEING CONTROLLED SHOULD BE INSPECTED FOR ANY DAMAGE. DO NOT OPERATE DAMAGED EQUIPMENT. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

When starting up the MHR in the normal operation mode, the MHR will cycle through a few start-up screens before going to the normal operation screen.

4.1 INITIALIZATION

During normal operation start-up, the MHR will initialize and provide its status for operation.

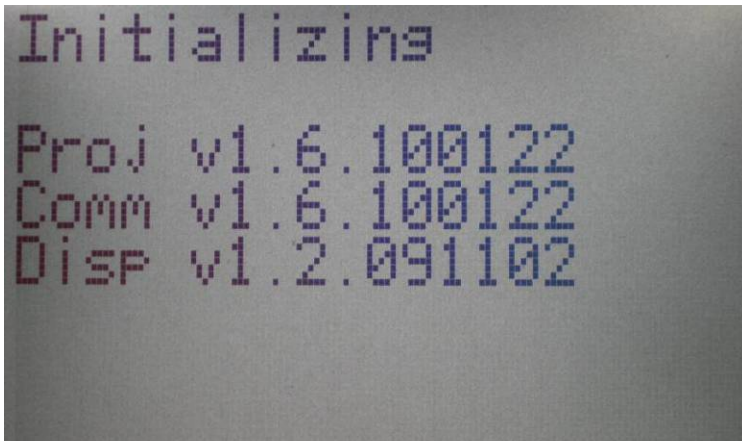


Figure 17: MHR Version Info Screen

Version Info: The first start-up screen is the Version Info screen. This screen displays the installed software versions of Project Code, Common Code, and Display software. These are needed if requesting help from the Magnetek Service Center.

Figure 18: MHR Access Code and Channel

RX Access Code and RX Channel: This second screen displays what the RX Access Code and Channel the receiver is set to.

The Access Code indicates the code needed by the Transmitter to control the Receiver. If the Transmitter and Receiver Access Code do not match, no communication will occur.

NOTE: During initialization of the MHR, both the PWR/COMM and STATUS/ERR LEDs will briefly illuminate. This is a normal function of the initialization process for the MHR.

4.2 NORMAL OPERATING SCREEN

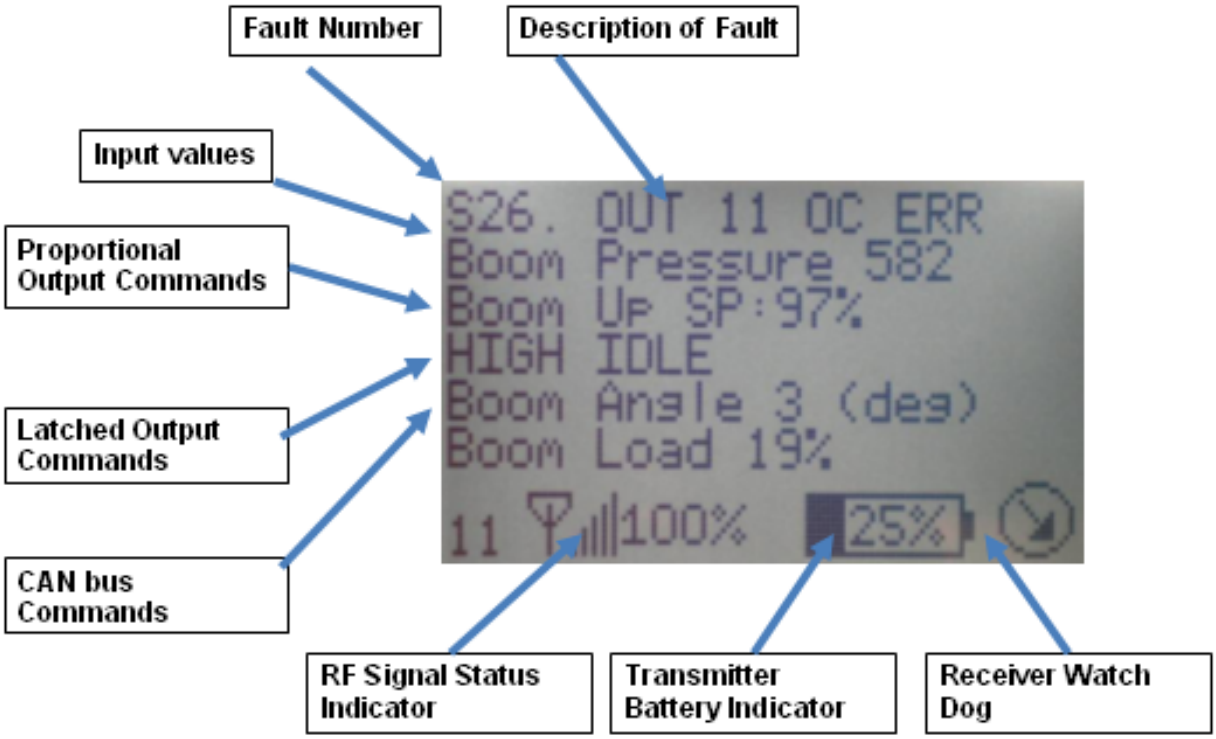


Figure 19: Normal Operating Screen

Field	Description
Description of Fault	In this example, Output 11 has an Overcurrent Error due to a faulty solenoid. See Section 4.3 for information regarding the normal operating status indications.
Fault Number	Each fault has a number and letter indicating an “S” System or “A” User alarm, which is useful in troubleshooting and installation.
Input Values	Analog or Digital Inputs can be displayed for monitoring purposes.
Proportional Output Commands	Active outputs are shown, indicating the function that is on and the level of output.
Latched Output Commands	The status of latched functions, such as Engine High/Low Idle or Pump On/Off, can be displayed to indicate if they are on or off.
CAN-bus Commands	Standard J1939 or other custom CAN-bus values can be displayed. This example shows a custom readout for The Boom Angle and Load.
RF Status Indicator	RSSI provides a measure of the quality and strength of the RF communication between the transmitter and receiver. This information can also be communicated over the CAN-bus.
Transmitter Battery Indicator	The life of the transmitter battery is displayed to indicate when it is time to change batteries. This information can also be communicated over the CAN-bus.
Receiver watch dog	The watch dog spins to indicate the MHR is in run mode and actively monitoring all aspects of the system.

WARNING

DO NOT ASSUME THE POWER IS OFF IN THE RECEIVER BECAUSE THE TRANSMITTER IS TURNED OFF. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

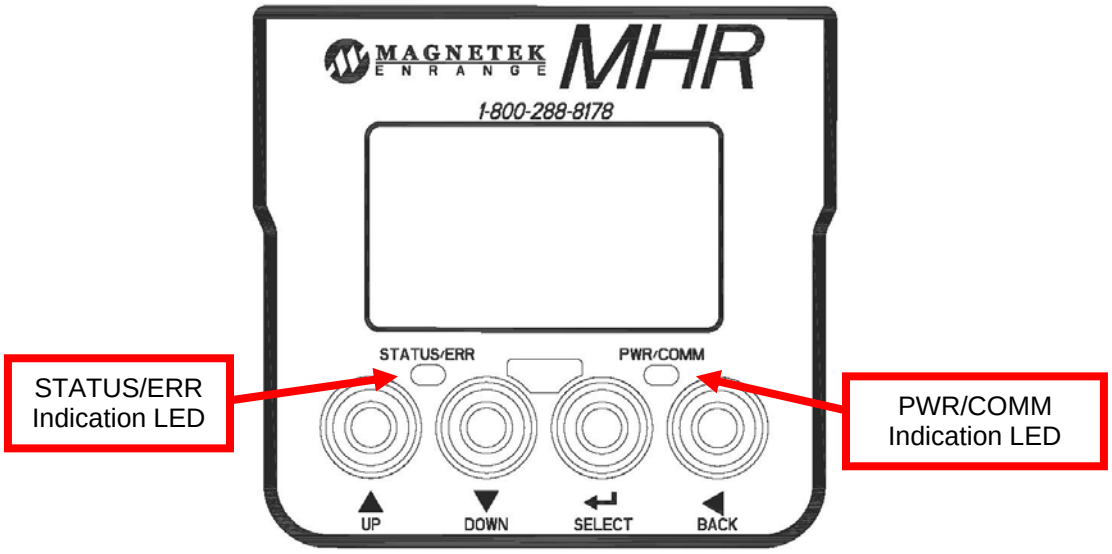
4.3 NORMAL OPERATING STATUS

When no faults (system or user) are shown on the top status line of the transmitter, there are three normal operating status messages that can be shown.

1. **SYSTEM GOOD, LINKED**: This indicates that there are no alarms within the MHR and a transmitter is connected to the MHR and actively transmitting to it.
2. **SYSTEM GOOD, NO LINK**: This indicates that there are no alarms within the MHR and that a transmitter had previously been connected to the MHR, but the transmitter has been shut off or gone out of range. This will also show if the MHR was just powered on and no transmitter has been linked yet.
3. **ESTOP ACTIVE**: This indicates that there are no alarms within the MHR and that the E-stop on the transmitter has been pressed.

4.4 LED STATUS INDICATION

The MHR has two LEDs for indicating the MHR status at a glance during normal operation. The left LED indicates the MHR's status while the right LED indicates power/communication.



4.4.1 STATUS/ERR LED (left LED on MHR faceplate)

Solid Green = Okay, no errors present

Solid Red = Error

Check the main screen for the error code and refer to Section 7.0 for troubleshooting and alarm code tables.

4.4.2 PWR/COMM LED (right LED on MHR faceplate)

Solid Blue = MHR is powered on

Solid Green = Active communication with transmitter

NOTE: The PWR/COMM LED illuminating solid green only occurs during the sending and receiving of data from the transmitter. When no data is being sent or received the LED will illuminate a solid blue.

NOTE: PWR/COMM only illuminates green when receiver is online with the transmitter. The PWR/COMM will not illuminate green after the transmitter goes offline from the receiver. This can occur when the transmitter powers down from inactivity or goes out of range. The start switch on the transmitter must be toggled to bring the transmitter back online with the receiver.

5.0 OPTIONAL PROGRAMMING WITH RCP

Using the optional RCP software makes programming of the MHR easier and allows for settings to be saved for future reference.

WARNING

THE USE OF RCP (RADIO CONTROL PROGRAMMER) IS INTENDED FOR USE BY AUTHORIZED PERSONS ONLY. CHANGES TO ANY RADIO DATA VALUE MAY LEAD TO UNEXPECTED, UNDESIRABLE, OR UNSAFE OPERATION OF EQUIPMENT AND FURTHERMORE MAY LEAD TO EQUIPMENT DAMAGE, PERSONAL INJURY, OR EVEN DEATH. ALL EQUIPMENT OPERATORS AND/OR PERSONNEL SHOULD BE NOTIFIED OF ANY RADIO DATA VALUE CHANGES THAT MAY AFFECT OPERATION.

5.1 ACCESS CODES

The receiver and transmitter must be programmed with the same access code to properly communicate with each other.

WARNING

TWO OPERATIONAL TRANSMITTERS WITH THE SAME ACCESS CODES OPERATING AT THE SAME TIME IS A DEFINITE SAFETY HAZARD – DO NOT OPERATE THEM AT THE SAME TIME. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

5.2 CHANGING TRANSMITTER ACCESS CODES

Transmitter Access Code Programming. For detailed instructions on setting parameters, including access codes, see the “Programming” section of the applicable transmitter manual.

WARNING

AFTER CHANGING THE ACCESS CODES ON THE TRANSMITTER, TEST THE UNIT BY TURNING IT ON AND OFF NEAR THE APPROPRIATE RECEIVER. IF THE RECEIVER DOES NOT RESPOND, DO NOT ACTIVATE A FUNCTION BUTTON! THE TRANSMITTER MAY HAVE THE WRONG ACCESS CODE, WHICH COULD MOVE OTHER EQUIPMENT. RE-CHECK THE ACCESS CODE IN THE TRANSMITTER AND RETEST. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH, AND DAMAGE TO EQUIPMENT.

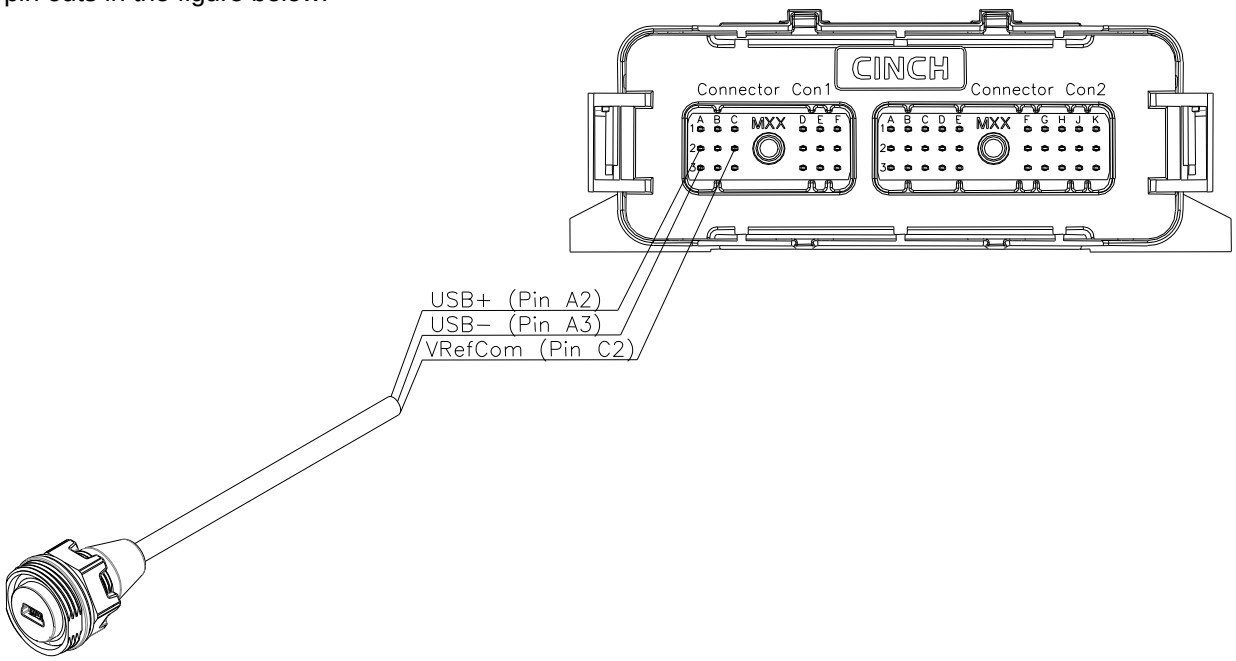
WARNING

THE ACCESS CODES IN THE RECEIVER ARE UNIQUE AND FACTORY PRESET. DO NOT CHANGE THESE ACCESS CODES UNLESS YOU ARE REPLACING AN EXISTING RECEIVER AND ITS ACCESS CODE. CHANGING THIS CODE COULD MAKE IT COMMON WITH ANOTHER RECEIVER ACCESS CODE, WHICH COULD MOVE OTHER EQUIPMENT. NO TWO SYSTEMS IN ANY LOCATION SHOULD EVER HAVE THE SAME ACCESS CODES INDEPENDENT OF THE FREQUENCY. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH, AND DAMAGE TO EQUIPMENT.

5.3 CONNECTING THE MHR TO A COMPUTER

The MHR receiver contains circuits that permit communication with a computer system via USB. If the MHR receiver was ordered with the 195-50481 MHR Pre-Wired Cable kit, the 195-50539 MHR USB cable can be added by simply plugging in the connector. This option provides a USB-mini B plug for connection to a computer system.

If not using the MHR Pre-wired Cable Kit, the MHR can be wired for USB connection using the pin outs in the figure below.



When plugging in an MHR receiver to a computer system, it is strongly recommended that a USB isolation hub, like Magnetek part 195-50645, is used between the MHR and the computer system.

WARNING

MHR RECEIVERS UTILIZING A DIFFERENT POWER SOURCE FROM THE COMPUTER SYSTEM BEING CONNECTED TO IT CAN HAVE A DIFFERENT GROUND POTENTIAL FROM THE COMPUTER SYSTEM. DIFFERENT GROUND POTENTIALS WILL DAMAGE EITHER THE COMPUTER SYSTEM OR THE MHR RECEIVER. AN ISOLATED USB HUB MUST BE UTILIZED TO PREVENT DAMAGE TO THE MHR, THE COMPUTER SYSTEM BEING CONNECTED TO THE MHR, OR BOTH.

5.4 PROGRAMMING WITH RCP

The Radio Control Programmer (RCP) is a user-friendly, Windows® based, interactive radio control programmer software. It is designed for communication from your PC to the MHR and other Magnetek radio control products.

For more information on how to program the MHR with the RCP, please reference the **RCP 2.x Users Guide** (p/n 178-01702-0010). This guide is available on Magnetek's website, and can be ordered from a Magnetek Sales Representative.

6.0 CHANNEL AND FREQUENCY DESIGNATIONS BY COUNT

Table

400 MHz Part 15

Channel	Frequency
01)	433.000 MHz
02)	433.050 MHz
03)	433.100 MHz
04)	433.150 MHz
05)	433.200 MHz
06)	433.250 MHz
07)	433.300 MHz
08)	433.350 MHz
09)	433.400 MHz
10)	433.450 MHz
11)	433.500 MHz
12)	433.550 MHz
13)	433.600 MHz
14)	433.650 MHz
15)	433.700 MHz
16)	433.750 MHz
17)	433.800 MHz
18)	433.850 MHz
19)	433.900 MHz
20)	433.950 MHz
21)	434.000 MHz
22)	434.050 MHz
23)	434.100 MHz
24)	434.150 MHz
25)	434.200 MHz
26)	434.250 MHz
27)	434.300 MHz
28)	434.350 MHz
29)	434.400 MHz
30)	434.450 MHz
31)	434.500 MHz
32)	434.550 MHz

6.1 2.4 GHz: FHSS

Channel sets are designated between 1 and 32. The frequency range is between 2402-2478 MHz. The frequency hopping protocol does not use one particular frequency to transmit a message. Messages are transmitted over multiple frequencies in a predefined sequence or channel set. In doing so, this protocol is able to compensate for interference that may be present on a single frequency by sending the message across multiple frequencies.

6.2 FCC STATEMENTS

Compliance Statement (Part 15.19)
This device complies with Part 15 of FCC rules.
Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

Warning (Part 15.21)
Changes or modifications not expressly approved by the party responsible for compliance should void the user's authority to operate the equipment.

This portable transmitter with its antenna complies with FCC's RF exposure limits for general population/uncontrolled exposure.

This receiver is available with optional licensed frequencies per customer request. If utilizing a licensed frequency, please refer to the factory application documentation that was shipped with the receiver or contact the factory for licensed frequency details.

7.0 TROUBLESHOOTING

7.1 TROUBLESHOOTING TABLE

Problems	Possible Reasons	Suggestions
Receiver will not turn on	Supplied voltage is out of the acceptable range	Ensure the voltage is with 12-24VDC nominal (9-36VDC max).
	Internal fuse has blown	Contact the factory.
Receiver will not respond to the transmitter	Incorrect system RF channel	Make sure the receiver and transmitter unit are both set to the same RF channel.
	Incorrect system access code	Make sure the receiver and transmitter both have the same access code.
	System out of range	Make sure that the startup procedure is initiated within 300 feet from the receiver location. If equipped with the Signal Strength Indicator, make sure the level is greater than 0%.
	The antenna on the receiver is missing, damaged, or improperly installed.	Inspect the antenna on the receiver for damage and try to place the antenna in a location that is visible when operating the equipment at all times.
	The antenna setting on the receiver is incorrect	Make sure the antenna setting (internal or external) is for the antenna type being used.
CAN messages are not being received by the receiver	The CAN message being sent is not supported	Use the supported messages OR contact your supplier to inquire about a software update.
	Termination resistor is not present or it has an incorrect value	Install termination resistor and verify correct value (120 Ohms at each end of the bus).
	Plugged into the incorrect CAN bus	Certain CAN messages may only be received on a specific CAN-bus. Work with your supplier to determine if this is the case.
	Incorrect baud rate	Ensure the correct baud rate is set by all devices on the bus.

CAN messages transmitted by the receiver are not being received	Incorrect source address	Make sure that the source address of the receiver is set correctly.
	The termination resistor is set incorrectly	Ensure the termination resistor is appropriately set.
	Incorrect baud rate	Ensure the correct baud rate is set by all devices on the bus.
Display is not functioning	Temperature is out of the operating range of the display	The display will only operate from -20°C to 70°C. If the display is not functioning, it does not mean the unit is not working. If the unit is not working due to extreme temperatures, an alarm will be activated.
Digital inputs are not functioning	Input voltage levels are incorrect	Ensure the proper voltage levels are used for logic high and low.
Valve is not operating	Faulty Wiring	Check all wires for loose or damaged connections.
	Output is shorted or opened	See Alarm Table below if value is given.
	Incorrect Valve Settings	Check Manufacturer Valve Specs with respect to PWM, Duty-Cycle, Voltage.
Clock is not working	Internal Battery is Dead	Consult factory.

7.2 ALARM TABLE

Alarm Number	Alarm Text	Cause of alarm	Effect of alarm	Recovery Action
0	S0. E-STOP ACTIVE	E-stop activated from the transmitter	1. Both E-stop outputs active 2. All outputs shut off as defined by the project	Disable condition that activated e-stop and press start
1	S1. CAN RX TO	Reception of a CAN message timed out	1. CAN message not received and processed 2. Depending on how the CAN messages are used, outputs may be shut off as defined by the project	Determine why the message(s) is (are) not being received. Once message(s) is (are) received again, the alarm will clear
2	S2. TEMP OUT OF RANGE	Temperature is out of the operating range of -40°C to +85°C	Outputs are shut off	Get temperature into acceptable operating range and the alarm will clear after 1 minute permitting outputs to operate again
3	S3. RF FAIL RECALIB	The radio chipset did not recalibrate properly	. Both E-stop outputs active and all outputs shut off	Power cycle the system
4	S4. RTC BATTERY LOW	The battery for the real time clock is not working	The real time clock will not be able to keep current time if unit is powered off	Contact the factory for MHR battery replacement
5	S5. RF INTERFER-ENCE	Another transmitter with the same project ID or access code within range	RF messages may not be correctly decoded and the machine may not operate correctly	Turn off the transmitter causing the interference
16	S16. OUT 1 OC ERR	When the output was activated, a current of over 3.5A was being drawn by the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine what has caused the overcurrent draw, fix the cause, and power cycle the system
17	S17. OUT 2 OC ERR	When the output was activated, a current of over 3.5A was being drawn by the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine what has caused the overcurrent draw, fix the cause, and power cycle the system

Alarm Number	Alarm Text	Cause of alarm	Effect of alarm	Recovery Action
18	S18. OUT 3 OC ERR	When the output was activated, a current of over 3.5A was being drawn by the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine what has caused the overcurrent draw, fix the cause, and power cycle the system
19	S19. OUT 4 OC ERR	When the output was activated, a current of over 3.5A was being drawn by the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine what has caused the overcurrent draw, fix the cause, and power cycle the system
20	S20. OUT 5 OC ERR	When the output was activated, a current of over 3.5A was being drawn by the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine what has caused the overcurrent draw, fix the cause, and power cycle the system
21	S21. OUT 6 OC ERR	When the output was activated, a current of over 3.5A was being drawn by the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine what has caused the overcurrent draw, fix the cause, and power cycle the system
22	S22. OUT 7 OC ERR	When the output was activated, a current of over 3.5A was being drawn by the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine what has caused the overcurrent draw, fix the cause, and power cycle the system
23	S23. OUT 8 OC ERR	When the output was activated, a current of over 3.5A was being drawn by the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine what has caused the overcurrent draw, fix the cause, and power cycle the system
24	S24. OUT 9 OC ERR	When the output was activated, a current of over 3.5A was being drawn by the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine what has caused the overcurrent draw, fix the cause, and power cycle the system

Alarm Number	Alarm Text	Cause of alarm	Effect of alarm	Recovery Action
25	S25. OUT 10 OC ERR	When the output was activated, a current of over 3.5A was being drawn by the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine what has caused the overcurrent draw, fix the cause, and power cycle the system
26	S26. OUT 11 OC ERR	When the output was activated, a current of over 3.5A was being drawn by the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine what has caused the overcurrent draw, fix the cause, and power cycle the system
27	S27. OUT 12 OC ERR	When the output was activated, a current of over 3.5A was being drawn by the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine what has caused the overcurrent draw, fix the cause, and power cycle the system
28	S28. OUT 13 OC ERR	When the output was activated, a current of over 3.5A was being drawn by the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine what has caused the overcurrent draw, fix the cause, and power cycle the system
29	S29. OUT 14 OC ERR	When the output was activated, a current of over 3.5A was being drawn by the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine what has caused the overcurrent draw, fix the cause, and power cycle the system
30	S30. OUT 15 OC ERR	When the output was activated, a current of over 3.5A was being drawn by the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine what has caused the overcurrent draw, fix the cause, and power cycle the system
31	S31. OUT 16 OC ERR	When the output was activated, a current of over 3.5A was being drawn by the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine what has caused the overcurrent draw, fix the cause, and power cycle the system

Alarm Number	Alarm Text	Cause of alarm	Effect of alarm	Recovery Action
32	S32. OUT 1 +VB SHORT	When the output is supposed to be at -VBat, a voltage of 2V or greater was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system
33	S33. OUT 2 +VB SHORT	When the output is supposed to be at -VBat, a voltage of 2V or greater was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system
34	S34. OUT 3 +VB SHORT	When the output is supposed to be at -VBat, a voltage of 2V or greater was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system
35	S35. OUT 4 +VB SHORT	When the output is supposed to be at -VBat, a voltage of 2V or greater was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system
36	S36. OUT 5 +VB SHORT	When the output is supposed to be at -VBat, a voltage of 2V or greater was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system
37	S37. OUT 6 +VB SHORT	When the output is supposed to be at -VBat, a voltage of 2V or greater was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system

Alarm Number	Alarm Text	Cause of alarm	Effect of alarm	Recovery Action
38	S38. OUT 7 +VB SHORT	When the output is supposed to be at -VBat, a voltage of 2V or greater was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system
39	S39. OUT 8 +VB SHORT	When the output is supposed to be at -VBat, a voltage of 2V or greater was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system
40	S40. OUT 9 +VB SHORT	When the output is supposed to be at -VBat, a voltage of 2V or greater was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system
41	S41. OUT 10 +VB SHORT	When the output is supposed to be at -VBat, a voltage of 2V or greater was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system
42	S42. OUT 11 +VB SHORT	When the output is supposed to be at -VBat, a voltage of 2V or greater was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system
43	S43. OUT 12 +VB SHORT	When the output is supposed to be at -VBat, a voltage of 2V or greater was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system

Alarm Number	Alarm Text	Cause of alarm	Effect of alarm	Recovery Action
44	S44. OUT 13 +VB SHORT	When the output is supposed to be at -VBat, a voltage of 2V or greater was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system
45	S45. OUT 14 +VB SHORT	When the output is supposed to be at -VBat, a voltage of 2V or greater was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system
46	S46. OUT 15 +VB SHORT	When the output is supposed to be at -VBat, a voltage of 2V or greater was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system
47	S47. OUT 16 +VB SHORT	When the output is supposed to be at -VBat, a voltage of 2V or greater was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system
48	S48. OUT 1 -VB SHORT	When the output is supposed to be at +VBat, a voltage of 2V or less was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system
49	S49. OUT 2 -VB SHORT	When the output is supposed to be at +VBat, a voltage of 2V or less was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system

Alarm Number	Alarm Text	Cause of alarm	Effect of alarm	Recovery Action
50	S50. OUT 3 -VB SHORT	When the output is supposed to be at +VBat, a voltage of 2V or less was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system
51	S51. OUT 4 -VB SHORT	When the output is supposed to be at +VBat, a voltage of 2V or less was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system
52	S52. OUT 5 -VB SHORT	When the output is supposed to be at +VBat, a voltage of 2V or less was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system
53	S53. OUT 6 -VB SHORT	When the output is supposed to be at +VBat, a voltage of 2V or less was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system
54	S54. OUT 7 -VB SHORT	When the output is supposed to be at +VBat, a voltage of 2V or less was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system
55	S55. OUT 8 -VB SHORT	When the output is supposed to be at +VBat, a voltage of 2V or less was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system

Alarm Number	Alarm Text	Cause of alarm	Effect of alarm	Recovery Action
56	S56. OUT 9 -VB SHORT	When the output is supposed to be at +VBat, a voltage of 2V or less was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system
57	S57. OUT 10 -VB SHORT	When the output is supposed to be at +VBat, a voltage of 2V or less was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system
58	S58. OUT 11 -VB SHORT	When the output is supposed to be at +VBat, a voltage of 2V or less was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system
59	S59. OUT 12 -VB SHORT	When the output is supposed to be at +VBat, a voltage of 2V or less was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system
60	S60. OUT 13 -VB SHORT	When the output is supposed to be at +VBat, a voltage of 2V or less was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system
61	S61. OUT 14 -VB SHORT	When the output is supposed to be at +VBat, a voltage of 2V or less was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system

Alarm Number	Alarm Text	Cause of alarm	Effect of alarm	Recovery Action
62	S62. OUT 15 -VB SHORT	When the output is supposed to be at +VBat, a voltage of 2V or less was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system
63	S63. OUT 16 -VB SHORT	When the output is supposed to be at +VBat, a voltage of 2V or less was seen on the output. The output was shut off to prevent damage to the hardware.	Output is shut off and will not operate until the cause is fixed and power to the system is cycled	Determine the cause of the short, fix the cause, and power cycle the system

7.3 ASSEMBLY AND REPLACEMENT PARTS

If your receiver ever needs repair, we always recommend that you have Magnetek perform the repair. If you need to refer to a parts list, refer to your receiver's drawing that was included in the shipment of your receiver. Please contact Magnetek's service department at 1.800.MAG.SERV for information regarding parts and service.

8.0 EU DECLARATION OF CONFORMITY

EU Declaration of Conformity Certificate

For the following equipment:

Product	:	Enrange Series Radio Remote Control
Manufacturer's Name	:	Magnetek, Inc.
Manufacturer's Address	:	N49 W13650 Campbell Drive
		Menomonee Falls, WI 53051 USA

The undersigned hereby declares on behalf of Magnetek, that the above-referenced product, to which this declaration relates, is in conformity with the provisions of CE Mark Directive (93/68/EEC), Machinery Safety Directive (MD) 2006/42/EC, Low Voltage Directive (LVD) 2006/95/EC, and Radio and Telecommunications Equipment Directive (R&TTE) 1999/5/EC.

The standards relevant for the evaluation of the product referenced above conformity to the directive requirements are as follows:

EN 301 489-1 v1.8.1 2008-04	EN 300 220-2 v2.1.2 2007-06
EN 301 489-3 v1.4.1 as modified by EN 62061	EN 300 328-2 v1.7.1 2006-05
EN 301 489-17 v2.1.1 2009-05	EN 60204-1 2006
EN 61010-1 2010	EN 60204-32 2008
EN ISO 13849-1	EN 13557 2009-05
EN 60950-1 2006	EN 60529 1992

The Technical Construction File is maintained at:	Magnetek, Inc N49 W13650 Campbell Drive Menomonee Falls, WI 53051 USA
The European contact for technical documentation is:	Brian Preston Magnetek Unit 3, Bedford Business Centre Mile Road Bedford MK42 9TW United Kingdom

Per Annex II.B of the Machinery Directive (2006/42/EC):

The machinery, product, assembly or sub-assembly covered by this Declaration of Conformity must not be put into service until the machinery into which it is to be incorporated has been declared in conformity with the provisions of the applicable Directive(s). This statement is only necessary where the product is to be incorporated into a machine or system (e.g. a safety component).

Signature of Authorized Person:

Ben Stoller / Director - Radio Controls For Magnetek, Inc. Menomonee Falls, WI USA	March 26, 2013 _____ Date of Issuance